OWNER'S OPERATING MANUAL

VX-40d / VX-50d / VX-60d / VX-80d

Digital Cinema Projectors

RUNCO

THE WORLD'S FINEST HOME THEATER PRODUCTS™

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For Projectors, Video Processors and Controllers

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This is a LIMITED WARRANTY as defined in the Magnuson-Moss Warranty Act. Please read it carefully and retain it with your other important documents.

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RUNCO INTERNATIONAL, INC.
Attn: Customer Service Department
2900 Faber Street
Union City, CA 94587
Ph: (510) 324-7777
Fax: (510) 324-9300
Toll Free: (800) 23-RUNCO

RUNCO VIDEO PRODUCT INFORMATION

RETAIN THIS INFORMATION FOR YOUR RECORDS

Model Purchased **Date**

Serial Number

Runco Authorized Dealer Name

Address

City **State/Province** **Postal Code**

Phone **Fax**

Preface

ABOUT THIS MANUAL
This manual is designed for use with the VX-40d, VX-50d, VX-60d and VX-80d projectors. Information in this document has been carefully checked for accuracy; however, no guarantee is given to the correctness of the contents. The information in this document is subject to change without notice.

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FCC COMPLIANCE
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

FEDERAL COMMUNICATIONS COMMISSION (FCC) STATEMENT
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

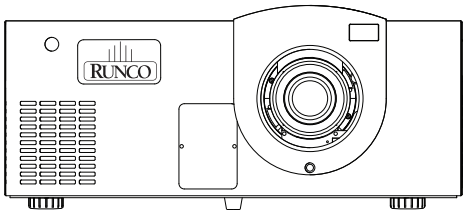
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Introduction

1.1 Projector overview

The Runco VX-40d, VX-50d, VX-60d and VX-80d Video Xtreme™ projectors are professional 3-chip projectors based on next-generation Digital Light Processing™ (DLP™) technology by Texas Instruments™. These projectors are compatible with standard international video formats and can interface with IBM®-compatible PC, Macintosh® computers and workstations. All models deliver high-brightness, high-resolution and high-quality images. Runco Video Xtreme™ projectors are an ideal choice for most exclusive home theaters.

Key Features



- Native SXGA+ resolution (1400 x 1050, fully scaleable)
- 10-bit video processing
- Built-in multi-standard video decoder
- Replaceable Xenon lamp
- Motorized lens mount
- Auto-setup feature
- Status LED display on built-in keypad for easy projector status monitoring
- Control with IR or built-in keypad

Refer to Section 6 for a complete list of specifications including brightness and contrast.

How the Projector Works

The projector accepts video input signals for projection onto front or rear flat screens. High-brightness light is generated by an internal Xenon lamp then modulated by three Digital Micromirror Device (DMD) panels that provide digitized red, green or blue color information. Light from the “on” pixels of each panel is reflected, converged and then projected to the screen through a single front lens, where all pixels are perfectly superimposed as a sharp full-color image.

1.2 Components

The following listed items are shipped with your projector. Ensure you have received all these items before using your projector.

- Owner’s Operating Manual (this document)
- Programmable theater master remote (includes four, 1.5V AAA batteries)
- Power cord
- Warranty Card

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Installation and Setup

2.1 Quick Setup

The instructions provided here are for those that are familiar with the projector and wish to quickly set it up and use it temporarily. Refer to the remaining subsections of this manual for a more complete setup.

Install the Projection Lens ◄ ***Step 1***

The projection lens is shipped separately from the projector and must be installed prior to setting up the projector. Install the projection lens as described in Section 4.5, *Replacing the Projection Lens*.

Remove the lens plug from the lens opening in the projector before installing the lens.

Remove the lens when shipping the projector and **reuse the lens plug** to prevent dust and debris from entering and settling on critical optical components.

Position the Projector ◄ ***Step 2***

Place the projector on a sturdy, level surface and position it so that it is perpendicular to the screen at a suitable distance. In general, the further back the projector is positioned from the screen, the larger the image will be.

If required, you can level the projector by adjusting its three feet. With the projector positioned perpendicular to the screen the image will appear rectangular and not keystoned.

For more detailed instructions on positioning the projector, refer to *Projector Position and Mounting* later in this section.

Connect a Source ◄ ***Step 3***

Located at the back of the projector is the input panel where all source connections are made. Each input is clearly labeled for easy identification. Using the appropriate cable(s), connect your source. Connect RGB and YPbPr sources to **INPUT 1** located in the upper right corner of the input panel. Use the DVI-I connector at **INPUT 2** to connect analog or digital display signals. INPUTS 3 and 4 (Composite and S-Video) are available but generally not used since these signals would be input to the included DHD Controller.

NOTE: One of the available optional input modules can be installed at **INPUT 5** *or* **INPUT 6** *for additional connections.*

Refer to Section 2.3, ***Connecting Sources****, for more details on connecting a specific source.*

Step 4 ➤ **Connect the Power Cord**

NOTE: The North American rated power cord is provided with each projector.

Plug the power cord to the AC receptacle located on the right hand side of the projector and the 3-pronged end into a grounded AC outlet. The input voltage to the projector must be between 100 and 240 VAC in 1000W models (VX-40d and VX-60d) and between 200 and 240VAC in 1200W models (VX-50d and VX-80d). Refer to Section 6, *Specifications*, for complete details on all power requirements.

Use the approved North American-rated power cord supplied with the projector. If you are connecting to an area outside of North America make sure you are using an appropriately rated power cord.

Step 5 ➤ **Turn the Projector ON**

Press the ⏻ POWER button on either the remote or built-in keypad to turn the projector on, or turn the power on the DHD Controller (after fully connecting it to the projector), which will also turn on the projector. Wait a few minutes to allow the projector to warm up. The LED status window displays an active pattern of segments to indicate the projector is changing its state from powered down to powered up. The message “On” appears in the display when the projector has completed its initialization and is ready for use.

Step 6 ➤ **Select a Source**

Press one of the input keys on the remote or built-in keypad to select and display the image for the source. With the DHD Controller, this would be either RGB (Input 1) or DVI (Input 2).

Step 7 ➤ **Adjust Image**

To perform an “Auto-setup,” press **FUNCS**, then **AUTO** followed by **Enter** to initiate an automated process in which the projector optimizes critical display parameters such as size, position, pixel tracking etc. for the selected source. Press Enter again to keep the new settings.

*NOTE: You can also access the menu system and adjust these and other image settings by pressing **MENU** on the remote.*

2.2 Installation Considerations

Proper installation of your projector will ensure the quality of your display. Whether you are installing a projector temporarily or permanently you should take the following into account to ensure your projector performs optimally.

Choose the installation type that best suits your needs: front or rear screen, floor mount or inverted mount.

Front Screen, Floor Mount Installation

Advantages	Considerations
• Easy to set up • Can be moved or changed quickly • Easy to access	• Shares floor space with audience

Front Screen, Inverted Mount (ceiling) Installation

Advantages	Considerations
• Does not take up audience space • Projector is unobtrusive • Projector cannot be accidentally moved	• Installation is more permanent • It is more difficult to access the projector

Rear Screen, Floor Mount Installation

Advantages	Considerations
• Projector is completely hidden • Projector is easily accessed • Usually good ambient light rejection	• Requires separate room • Installation cost is usually higher

Rear Screen, Inverted Mount (ceiling) Installation

Advantages	Considerations
• Projector is completely hidden • Usually good ambient light rejection	• Requires separate room • Installation cost is usually higher

Rear Screen, Floor Mount with Mirror

Advantages	Considerations
• Projector is completely hidden • Usually good ambient light rejection • Requires less space behind screen than other rear screen installations	• Requires separate room • Installation cost is usually higher

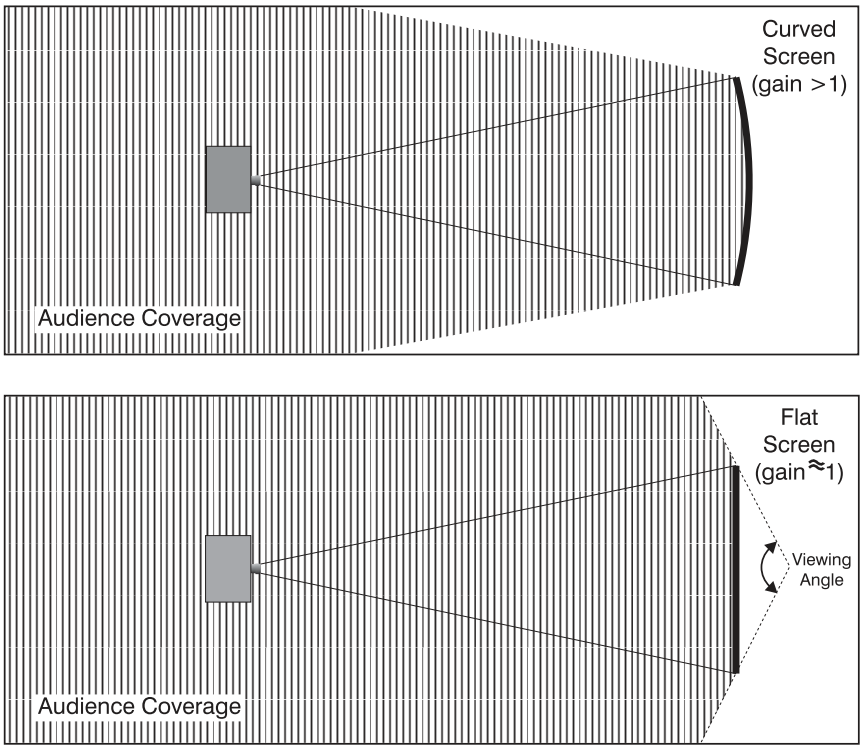
Front Screen Installations

◄ ***Screen Type***

In front-screen installations, the projector and audience are positioned in front of the screen, which can be flat or curved.

Flat screens are recommended with this projector. They offer a gain of about 1 with a viewing angle just less than 180°. This type of screen reflects incident light equally in all directions so the audience can see the display from various angles.

Curved screens have a gain greater than 1 with a viewing angle much less than 180°. This type of screen does not reflect incident light equally in all directions; instead, it is concentrated in a viewing cone. The audience sitting within the viewing cone area sees a brighter image than those sitting just outside this area. Runco generally does not recommend use of curved screens with the Video Xtreme series, due to excessive brightness and uncorrectable geometrical distortion.



Rear screen installations
There are two basic types of rear screens: diffused and optical.

A diffusion screen has a surface which spreads the light striking it. Purely diffused screens have a gain of less than 1. The main advantage of the diffused screen is its wide viewing angle, similar to that of a flat screen for front screen projection. This type of screen is suitable when a wide viewing angle is required but there is low ambient room lighting.

Optical screens take light from the projector and redirect it to increase the light intensity at the front of the screen. This reduces it in other areas. A viewing cone similar to that of a curved, front-screen installation is created. This type of screen is better suited for brightly lit rooms where the audience is situated within the viewing cone.

Screen size
Choose a screen size that is appropriate for your lens and application. The size of the room and viewing distance are the defining factors; a rule of thumb is that the primary viewing distance be 1.5 times the screen width.

To fill a screen with an image, the aspect ratio of the screen should be equal to the aspect ratio of the image (expressed as the ratio of its width to its height). Standard video from a VCR has a 4:3 or 1.33:1 aspect ratio. For example, to display a VCR output with a 4:3 aspect ratio onto a 10-foot (3m) high screen, the width of the screen must be at least 13.3 feet (4m).

◄ ***Ambient Light***

The high brightness of this projector is well suited for locations where ambient lighting might be considered less than ideal for projection. A typical room with ceiling lights and windows rarely requires special attention. Contrast ratio in your images will be noticeably reduced only if light directly strikes the screen, such as when a shaft of light from a window or floodlight falls on the image. Images may then appear washed out and less vibrant.

In general, avoid or eliminate light sources directed at the screen.

◄ ***Other Considerations***

Other considerations and tips that can help improve your installation:

- Keep the ambient temperature constant and below 35°C (95°F). Keep the projector away from heating and/or air conditioning vents. Changes in temperature may cause drifts in the projector circuitry, which may affect performance.
- Keep the projector away from devices that radiate electromagnetic energy such as motors and transformers. Common sources of these include slide projectors, speakers, power amplifiers, elevators, etc.

◄ ***Projector Position and Mounting***

Throw distance

Throw distance is the distance measured from the projector's lens to the screen. This is an important calculation in any projector installation, as it determines whether or not you have enough room to install your projector with a desired screen size and if your image will be of the right size for your screen.

You can quickly estimate the throw distance by taking the width of the screen and multiplying it by the lens throw ratio. See Figure 2.1. The result of this calculation tells you roughly how far back the projector should be positioned from the screen in order to project a focused image large enough to fill the screen. For example, using a 0.75:1 lens, throw distance would roughly be 0.75 x screen width.

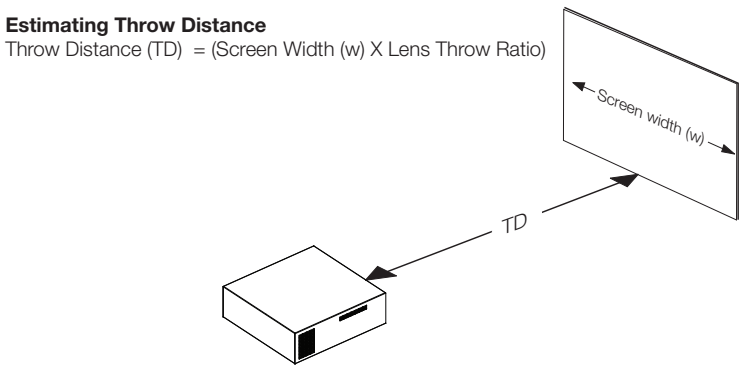


Figure 2.1 Estimating Throw Distance

Vertical and horizontal position

The correct vertical and horizontal position of the projector in relation to the screen depends on the lens type and the screen size. Ideally, the projector should be positioned perpendicular to the screen. This way, the image will appear rectangular instead of keystoned (trapezoidal).

The **vertical position** of the image can be offset – that is, moved above or below the optical axis (lens center) – by adjusting the fully motorized lens mount using the keypad. The amount of vertical offset available depends directly on the lens installed in the projector and can be slightly limited if horizontal offset has been applied.

Vertical offset can also be expressed as the percent of half the image height OR the number of pixels of shift from lens center. See Figure 2.2 for some illustrated examples of vertical offset.

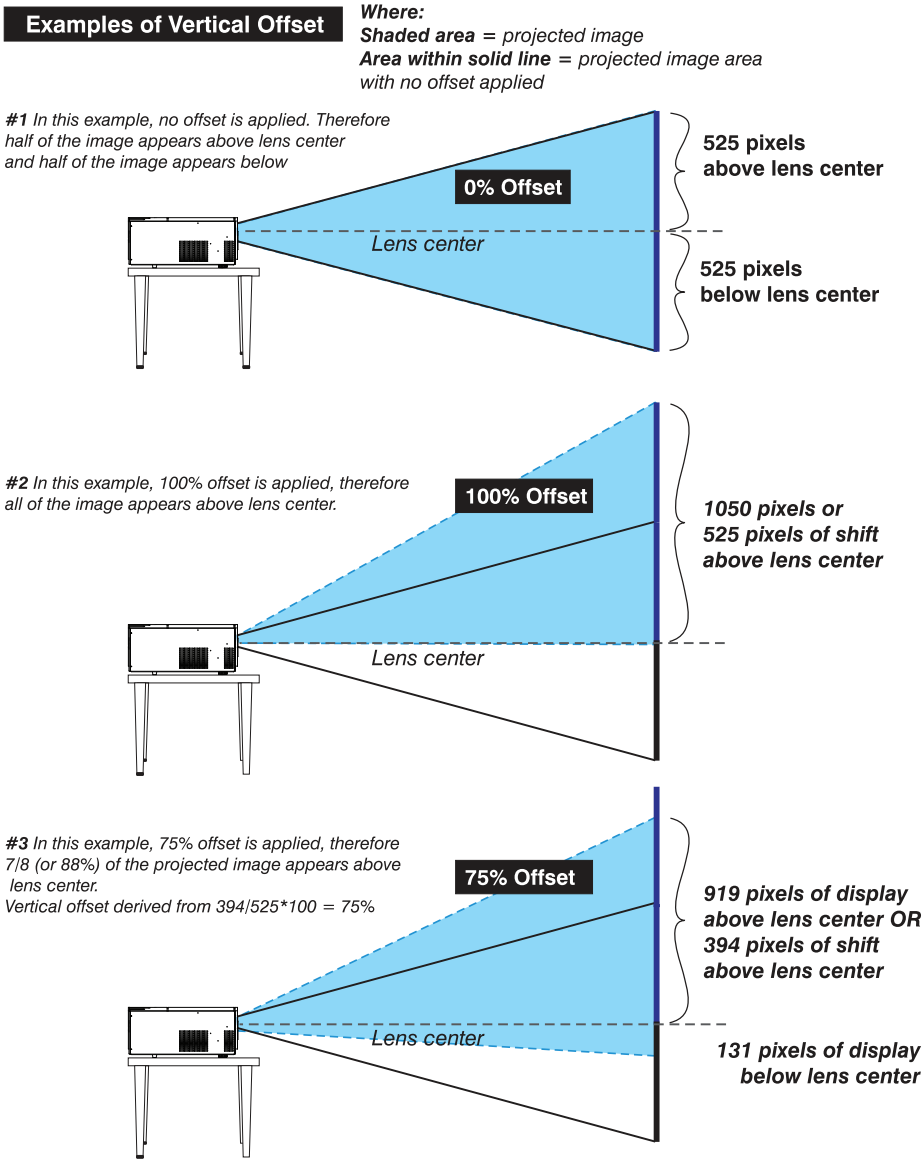

Examples of Vertical Offset
Where:
Shaded area = projected image
Area within solid line = projected image area with no offset applied
#1 In this example, no offset is applied. Therefore half of the image appears above lens center and half of the image appears below
0% Offset
Lens center
525 pixels above lens center
525 pixels below lens center
#2 In this example, 100% offset is applied, therefore all of the image appears above lens center.
100% Offset
Lens center
1050 pixels or 525 pixels of shift above lens center
#3 In this example, 75% offset is applied, therefore 7/8 (or 88%) of the projected image appears above lens center.
Vertical offset derived from 394/525*100 = 75%
75% Offset
Lens center
919 pixels of display above lens center OR 394 pixels of shift above lens center
131 pixels of display below lens center

Figure 2.2 Examples of Vertical Offset

Table 2.1, Table 2.2 and Figure 2.3 show the maximum vertical offset of a lens or alternatively, how much of your projected image will appear above or below lens center if the maximum vertical offset is applied using that lens.

Table 2.1 Lens Offsets for the VX-40d / VX-50d

Lens Type	Vertical Offset (% of Half Height)		Maximum amount of projected image above or below lens center		Horizontal Offset (% of Half Width)		Maximum amount of projected image to one side of lens center	
	%	Pixels	%	Pixels	%	Pixels	%	Pixels
0.8:1 fixed	37%	+/-196	69%	+/-721	22%	+/-153	61%	+/-853
1.6 - 2.0:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
2.0 - 2.7:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
2.7 - 5.0:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
5.0 - 8.0:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050

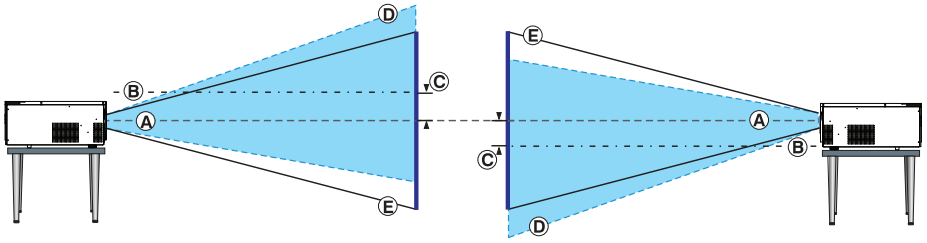
% Offset = # pixels of offset / half panel resolution x 100.

Table 2.2 Lens Offsets for the VX-60d / VX-80d

Lens Type	Vertical Offset (% of Half Height)		Maximum amount of projected image above or below lens center		Horizontal Offset (% of Half Width)		Maximum amount of projected image to one side of lens center	
	%	Pixels	%	Pixels	%	Pixels	%	Pixels
0.73:1 fixed	37%	+/-196	69%	+/-721	22%	+/-153	61%	+/-853
1.45 - 1.8:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
1.8 - 2.5:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
2.5 - 4.5:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050
4.5 - 7.3:1 zoom	100%	+/-525	100%	+/-1050	50%	+/-350	75%	+/-1050

% Offset = # pixels of offset / half panel resolution x 100.

Vertical Offset for 0.73:1 Fixed Lens



Where:

- (A) = *Lens center (optical axis)*
- (B) = *Projected image vertical center*
- (C) = *Vertical offset (maximum)*
- (D) = *Projected image area with full offset applied (shaded area)*
- (E) = *Projected image area with no offset applied (area within solid lines)*

Vertical Offset for 1.6 - 2.0:1, 2.0 - 2.7:1, 2.7 - 5.0:1, 5.0 - 8.0:1 Zoom Lens

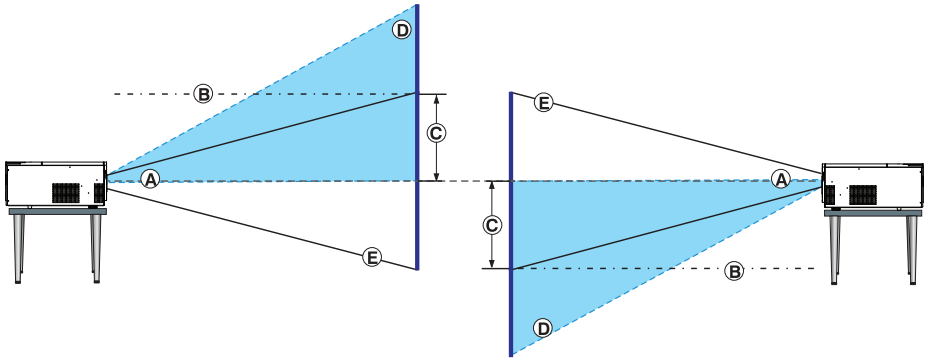


Figure 2.3 Lens Vertical Offsets

The **horizontal position** of the image can be offset – that is, moved to the left or right of lens center – by adjusting the fully motorized lens mount. The amount of horizontal offset available depends on the lens installed and if the image has already been vertically offset. Horizontal offset can also be expressed as the percent of half the image width – the number of pixels of shift to one side of lens center. See Figure 2.4 for some illustrated examples of horizontal offset.

Also refer to Tables 2.1, Table 2.2 and Figure 2.5, which shows the maximum horizontal offset of a lens or alternatively, how much of your projected image will appear to one side of lens center if the maximum horizontal offset is applied using that lens.

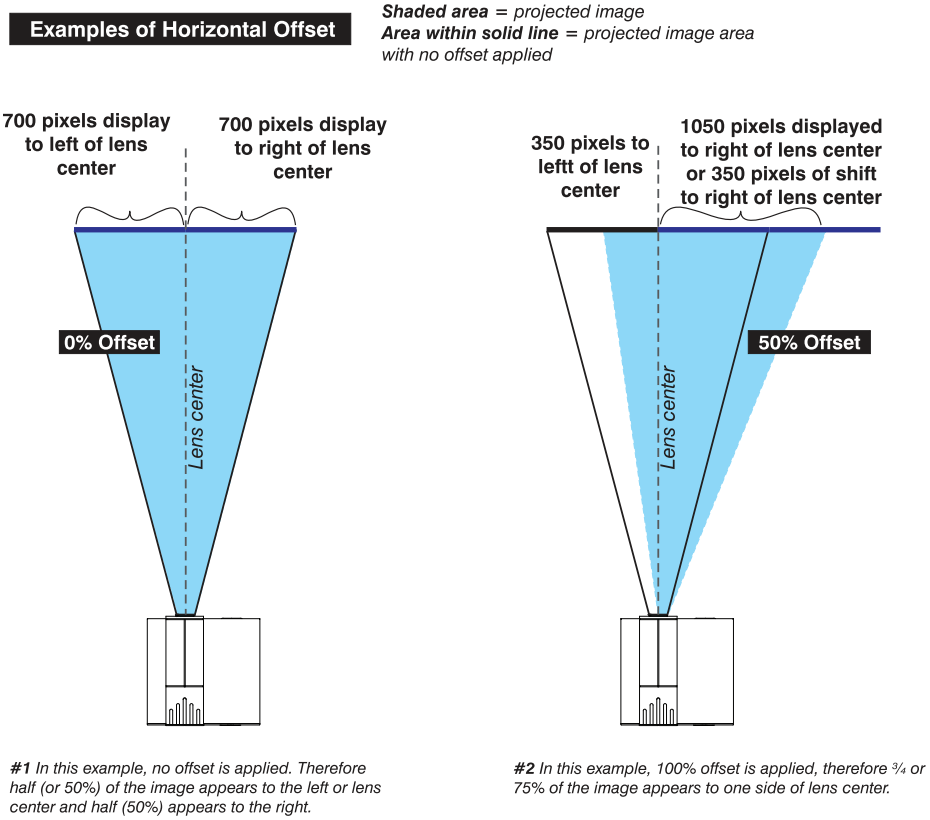
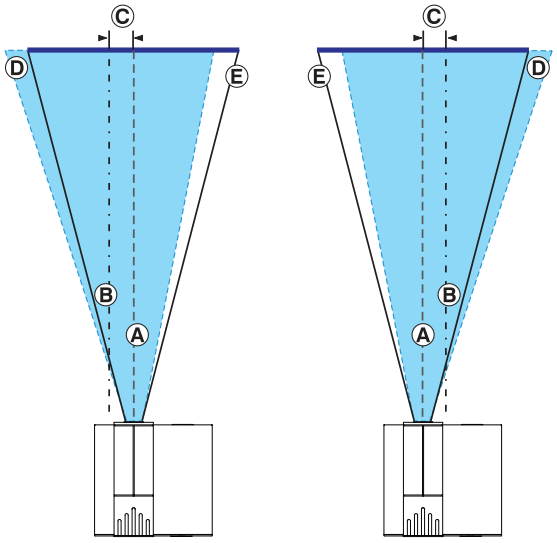

Examples of Horizontal Offset
Shaded area = projected image
Area within solid line = projected image area with no offset applied
700 pixels display to left of lens center
700 pixels display to right of lens center
0% Offset
Lens center
350 pixels to leftt of lens center
1050 pixels displayed to right of lens center or 350 pixels of shift to right of lens center
50% Offset
Lens center
#1 In this example, no offset is applied. Therefore half (or 50%) of the image appears to the left or lens center and half (50%) appears to the right.
#2 In this example, 100% offset is applied, therefore ¾ or 75% of the image appears to one side of lens center.

Figure 2.4 Horizontal Offset Examples

Horizontal Offset for 0.73:1 Fixed Lens



Where:

- Ⓐ = *Lens center (optical axis)*
- Ⓑ = *Projected image horizontal center*
- Ⓒ = *Horizontal offset (maximum)*
- Ⓓ = *Projected image area with full offset applied (shaded area)*
- Ⓔ = *Projected image area with no offset applied (area within solid lines)*

Horizontal Offset for 1.6 - 2.0:1, 2.0 - 2.7:1, 2.7 - 5.0:1, 5.0 - 8.0:1 Zoom Lens

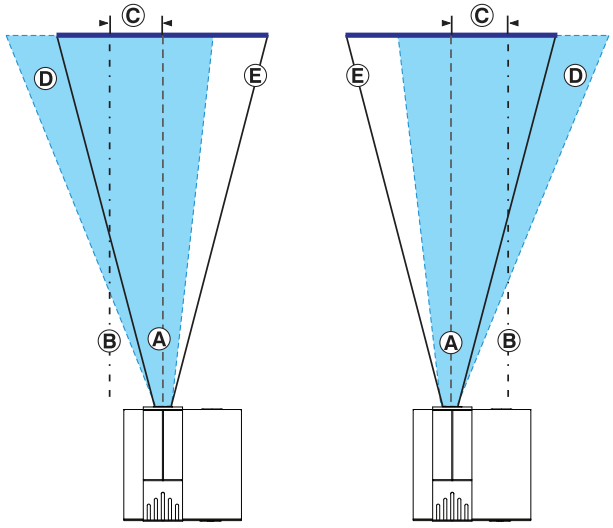


Figure 2.5 Horizontal Offset Examples

Mounting

There are several methods for mounting the projector. Depending on your chosen installation, one method may be more suitable than another. In typical front and rear screen installations the projector can be mounted to a secure and level surface, such as a table or cart. Carts are useful when moving a projector during a presentation or from site to site. If possible, lock the wheels when it's in position to prevent it from being moved during a presentation.

CEILING MOUNT—The projector can also be inverted and suspended from the ceiling using a specially designed ceiling mount fixture. This type of mounting is recommended for fixed installations and for those that want the projector out of sight or have a limited space for projector and audience.

Use only the Runco-approved ceiling mount kit designed for your projector.

SPECIAL MOUNTING—The projector can be rotated (front-to-back) up to 360 degrees and mounted without it affecting performance. However, the side-to-side tilt limit of the projector must not exceed ±15 degrees. This tilt limit is required to ensure optimal performance of the lamp. See Figure 2.6.

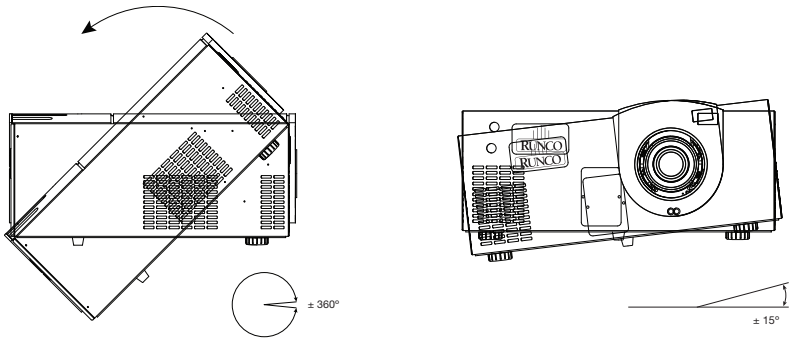


Figure 2.6 Mounting Angle Ranges (Front-to-Back and Side-to-Side)

Adjusting projector height

To compensate for a slightly unlevel mounting surface, you can modify the height of the projector by adjusting the two feet threaded into the front bottom chassis. Turn each foot clock-wise or counterclockwise until the projector is level on all sides. See Figure 2.7.

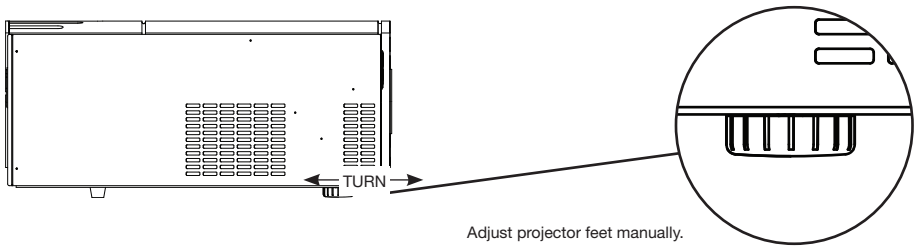


Figure 2.7 Projector Height Adjustment

Folded Optics

In rear-screen applications where space behind the projector is limited, a mirror may be used to fold the optical path. See Figure 2.8. The position of the projector and mirror must be accurately set. If you are considering this type of installation, call your dealer for assistance.

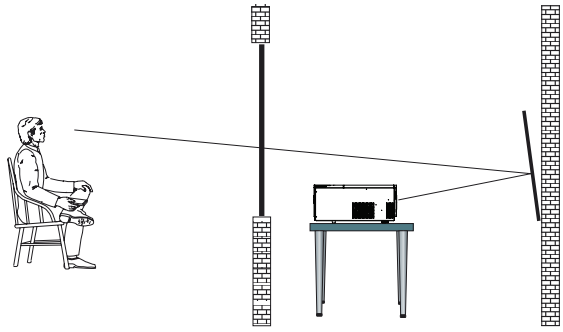
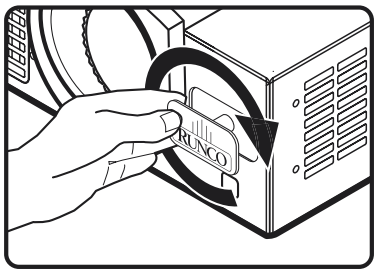


Figure 2.8 Folded Optics

Runco Logo

The Runco logos on the front and rear of the projector can be rotated to match a floor or ceiling installation. To rotate the logo, grip it at the sides, pull it away from the projector and rotate it 180 degrees.



2.3 Connecting Sources

Sources connect to the Input Panel located at the back of the projector. See Figure 2.9.

The upper right corner (**INPUT 1**) typically accepts an *RGB* signal from an external analog RGB source, or it can also be used for YPbPr signals or additional video sources. The DVI-I connector (**INPUT 2**) accepts digital or analog display signals from a computer. **INPUT 3** accepts and analog composite video signal; **INPUT 4** an S-Video signal. (Normally, however, you would connect these types of signals to the DHD Controller.)

There are also several optional interfaces available for connecting other sources. These interfaces slide into the remaining unused option slot, and can be done while the projector is running.

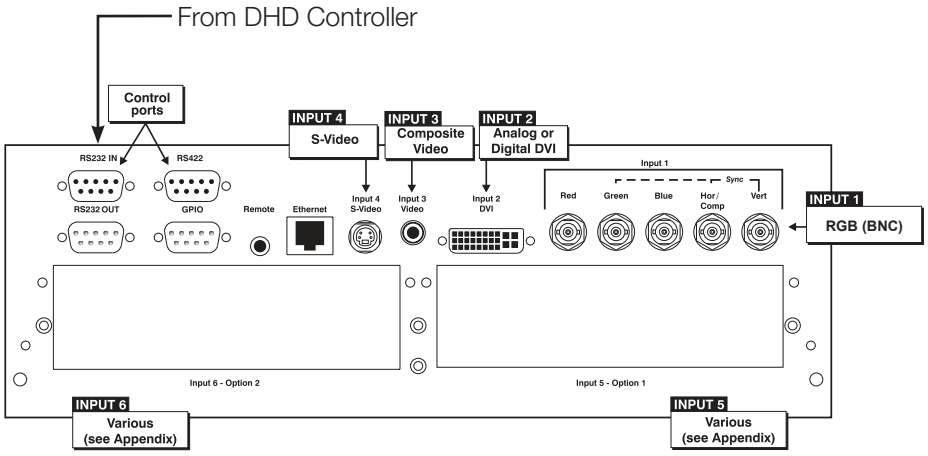


Figure 2.9 Input Panel

NOTES:
1) *Refer to Section 6,* ***Specifications,*** *for details regarding compatible inputs.*
2) *Use only high-quality, shielded cables for all connections.*

◄ ***RGB Signals***

INPUT 1 consists of 5 BNC connectors and can be used as the input from the DHD Controller. This projector supports multiple sync types with RGB signals: sync-on-green, composite sync, and separate H and V syncs.

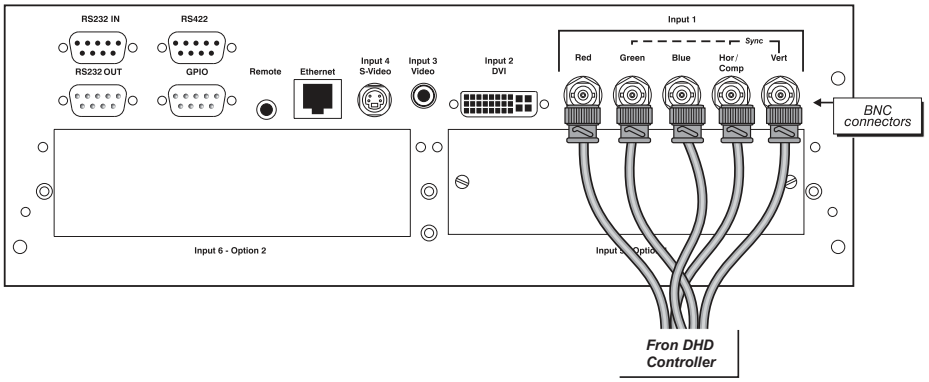


Figure 2.10 Connecting RGB and Sync

NOTES:
1) *If, for some reason, the projector fails to recognize a signal as an RGB signal, specify this* ***Color Space*** *option within the* ***Image Settings*** *menu. Refer to Section 3.5****, Adjusting the Image.***
2) *To connect YPbPr signals – such as from DVDs or analog HDTV sources – to* **INPUT 1,** *use the red, green and blue BNCs as described in* ***YPbPr*** *Signals (below).*

YPbPr signals ➤ (COMPONENT VIDEO)

Connect a YPbPr signal (component video) to **INPUT 1** or **INPUT 2** as shown in Figure 2.11.

NOTES:
1) *If, for some reason, the projector fails to recognize a YPbPr signal, specify this* ***Color Space*** *option within the* ***Image Settings*** *menu. Refer to Section 3.5****, Adjusting the Image.***
2) *Do not connect digital component signals (known as YCbCr) to* **INPUT 1.** *Install an appropriate optional module in* **INPUT 5** *or* **INPUT 6** *for this.*

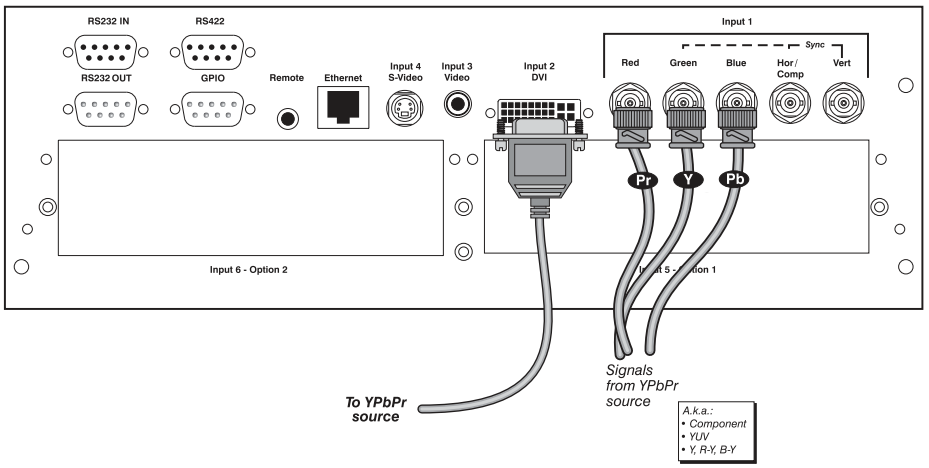


Figure 2.11 Connecting YPbPr sources

Composite and S-Video

INPUT 3 and **INPUT 4** provide simultaneous connection of both a composite video source (**INPUT 3**) and an S-Video source (**INPUT 4**), though typically these connections would be made at the DHD Controller. See Figure 2.12.

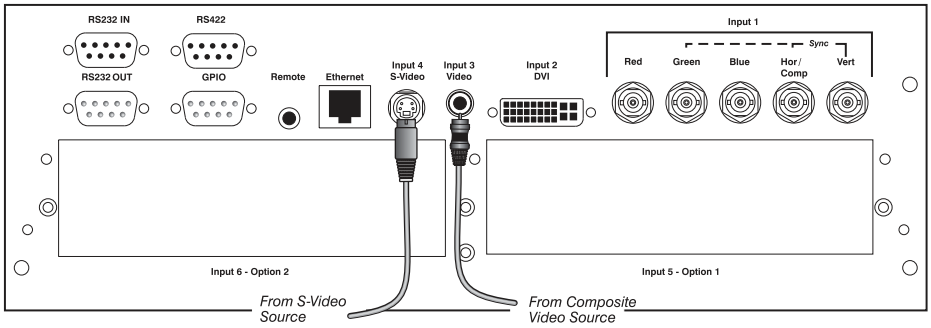


Figure 2.12 Connecting Composite or S-Video sources

➤ *DVI Digital Video*

Use the DVI-I connector at **INPUT 2** to connect either analog or digital video devices to the projector. You can connect the DHD Controller here as well; if you do this, change the Display Device setting on the DHD Controller to **DVI**.

Use a cable with DVI-I connectors at both ends to connect devices that transmit digital and analog video signals such as high-quality DVD players, satellite receiver and digital cable TVs.

NOTES:
1) *To ensure true digital output from devices that transmit digital signals, connect to the DVI-I connector.*
2) *DVI loop through is not available unless you have the optional* ***DVI Input Module*** *installed at* **INPUT 5** *or* **INPUT 6***.*

➤ *Optional Inputs*

Refer to Appendix D, *Optional Input Modules*, for a list of available optional input modules.

2.4 Connecting Communications

Remote Keypads ➤

As desired, direct the projector's IR remote keypad towards the projector's IR sensors. In normal operation, the DHD Controller will control the projector, but for setup and calibration, use the projector remote.

Serial Port Connections ➤

There are two types of serial ports available on the projector: RS232 and RS422. The RS232 port is used for communication with the DHD Controller, and subsequently the RS422 port will be unused. If the projector is used as a standalone unit, either port could be used for serial control.

Connecting RS232 from the DHD Controller

The 9-pin DIN connector labeled RS232 IN on the input panel is dedicated to serial communication with the DHD Controller. Using the appropriate serial communication cables and supplied adapter, connect the DHD Controller.

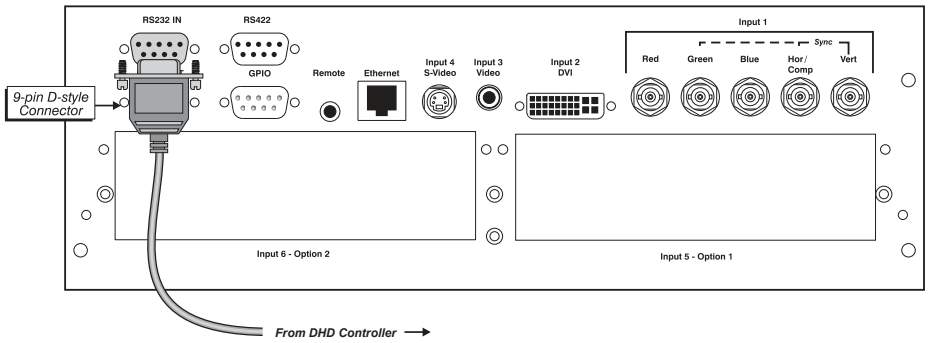


Figure 2.13 Connecting RS232 from the Controller

Connecting RS422

If you wish to control the projector with an automation system with RS422 capability and a DHD Controller is not used (not recommended), connect a RS422 serial communication cable between the automation system and the RS422 port on the projector. RS422 is better suited for serial communication over long distances than is RS232 communication.

Use the RS422 port only if your device has RS422 capability — always consult the literature provided with your equipment before connecting. Connecting to the RS422 port with incompatible equipment could damage your projector.

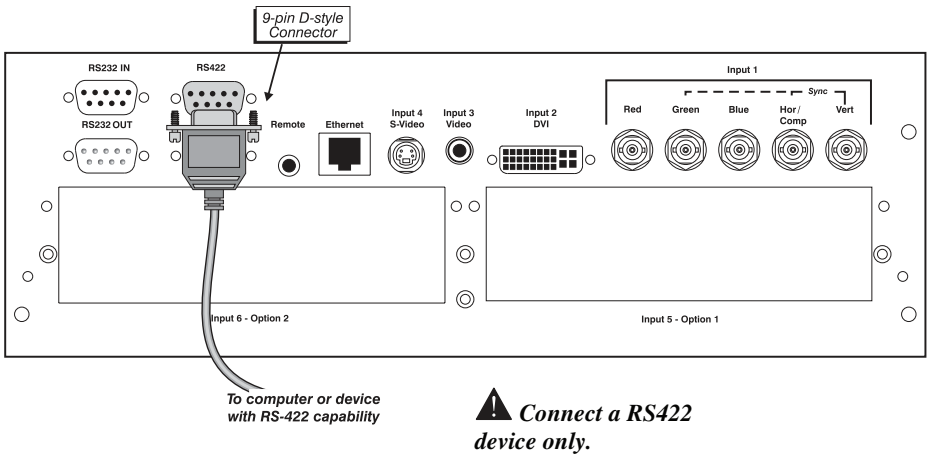


Figure 2.14 Connecting RS422

Reserved for future use.

➤ ***Ethernet Port***

2.5 Power Connection

Plug the power cord to the AC receptacle located at the back of the projector, below the input panel, and the 3-pronged end into a grounded AC outlet. The input voltage to the projector must be between 100 and 240 VAC in 1000W models (VX-40d and VX-60d) and between 200 and 240VAC in 1200W models (VX-50d and VX-80d). *(See also Section 6 – Specifications for complete details on all power requirements.)*

Use the approved North American-rated power cord supplied with the projector. If you are connecting to an area outside of North America make sure you are using an appropriately rated power cord.

Always power down the projector before unplugging the AC power cord. Wait 5 to 10 minutes for the main exhaust fan to turn off and for the lamp to cool sufficiently before unplugging the projector.

WARNINGS

Do not attempt operation if the AC supply and cord are not within the specified voltage and power range.

Wait for the cooling fans to turn off before unplugging the projector.

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Operation

3.1 About the Projector

This section explains how to effectively operate the projector once it has been installed. Runco recommends that you read this section and familiarize yourself with the components and the available menu options before you begin using your projector.

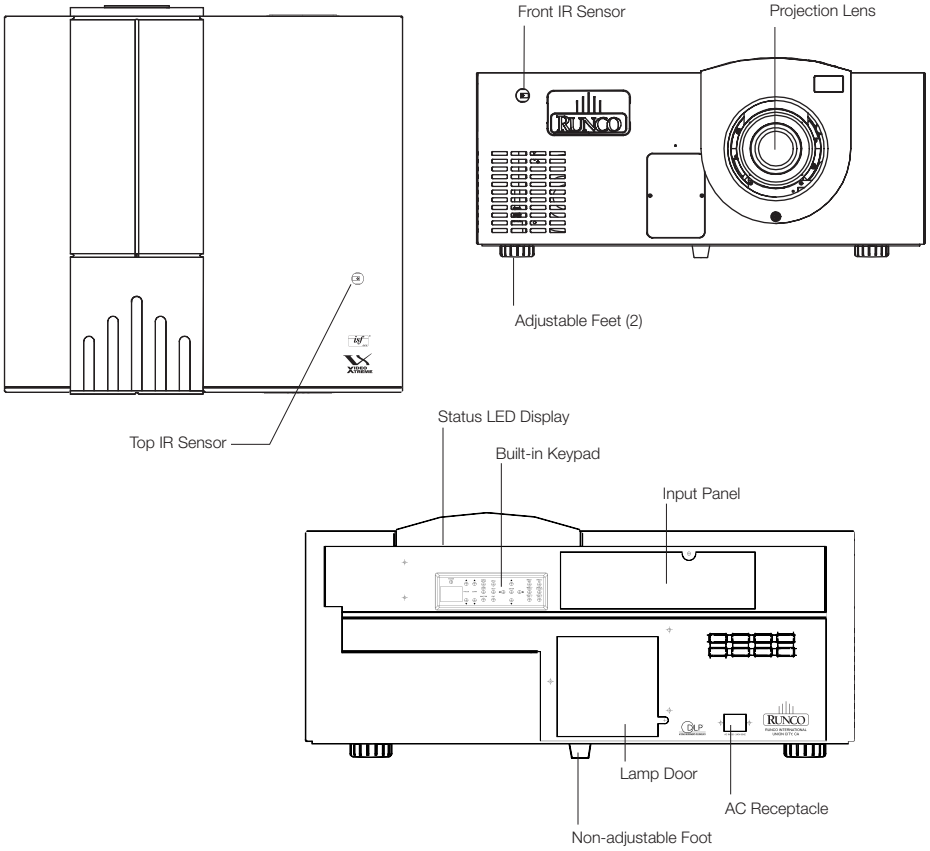


Figure 3.1 Projector Basics

◄ Built-in Keypad

The built-in keypad is located at the back of the projector, beside the input panel. Use it similarly to the IR remote to control the projector. A status LED display is also included on this keypad for monitoring projector status.

◄ AC Receptacle

The AC receptacle is located at the back of the projector just below the input panel. Use this outlet to plug in an appropriately rated power cord. Refer to Section 6, *Specifications,* for details.

◄ Adjustable Feet

Located on the underside of the projector are two fully adjustable feet. Raise or lower these feet when positioning the projector to ensure it is level on all sides so the displayed image will appear rectangular without any keystone. *NOTE: The third foot, located at the rear of the projector (underside) is not adjustable.*

Refer to *Adjusting Projector Height* in Section 2 for instructions on how to adjust the projector's feet.

Lens Mount and Projection Lenses ➤

The projector is built with a motorized lens mount that allows for easy lens control and adjustment. This includes such functions as adjusting vertical and horizontal offsets, zoom and focus. The lens mount can be fitted with any one of the available optional lenses. Refer to Section 6, *Specifications*.

- **Zoom and Focus** — There are two internal lens motors that allow for quick motorized adjustment of zoom and focus. Adjust zoom to fit the displayed image on the screen and adjust focus to improve the clarity of the image.

- **Lens Offset** — Vertical and horizontal offset is performed on the lens mount through the use of DC motors.

- **Shutter** — Standard on all models, the shutter allows you to turn the screen absolutely black when in the "on" state. To operate the shutter, press the **MUTE** button on the remote and hold it for 1-2 seconds. Or, press the **Shutter** button on the built-in keypad.

- **Optical Aperture** — Enables adjustment of light output and contrast ratio. The optical aperture control is in the Advanced Image Settings menu (described later in this section).

NOTES:
1) *The projection lens is shipped separately from the projector.*
2) *Use the lens cap when transporting the projector to avoid scratching and damaging the lens, which could affect your displayed image.*

Input Panel ➤

Connect your signal sources to the input panel on the back of the DHD controller; refer to the DHD controller manual for details. Connect the RGB and/or DVI output of the DHD Controller to **INPUT 1** and/or **INPUT 2** respectively on the projector.

Cooling and Air Vents ➤

There are numerous air vents located around the projector. It is important these vents remain unobstructed. Adequate airflow through the projector will prevent it from overheating.

Front and Top IR Sensors ➤

The two IR sensors located on the projector receive transmissions from the IR remote from up to 100 feet away. It is important to keep the transmission path to these sensors unobstructed for uninterrupted communications with the projector. The front IR sensor is located next to the projector's nameplate and the top IR sensor is located at the top of the projector.

Lamp Door ➤

The lamp door is located at the back of the projector, which provides easy access to the lamp module for replacement. Refer to Section 4.4, *Lamp and Filter Replacement*, for lamp replacement procedures.

3.2 Using the Remote or Built-in Keypad

◄ ***Keypad Commands***

The projector can be controlled using one of the following keypads:

- ***Built-in Keypad*** (located at the back of the projector)
- ***Theater Master Infrared (IR) Remote***

Although each keypad provides complete control of the projector, they differ slightly in their arrangement of keys and in what functions can be accessed directly with a key press (as opposed to using the menu system). You may find one keypad more convenient than another for your specific installation and application.

◄ ***Built-in***

To control the projector when signals from a remote keypad cannot reach the projector, use the projector's built-in keypad. The nearby LED display provides feedback indicating current status and activities of the projector. Because the built-in keypad has fewer keys than the remote keypad, certain projector functions are accessible only through the menu system rather than via a direct key.

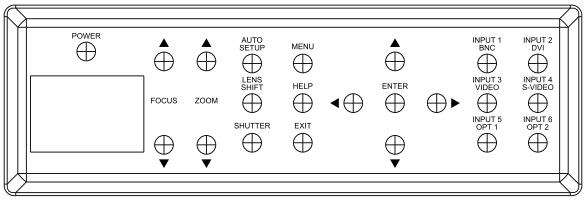


Figure 3.2 Built-in Keypad

See Figure 3.3 and refer to the key function descriptions for the IR remote that follow.

◄ ***IR Remote***

The IR remote keypad controls the projector by way of wireless communications from a battery-powered infrared transmitter. Use the IR remote keypad the same way you would use a remote keypad supplied with a TV or VCR. When making key presses, direct the keypad toward the front or top of the projector. One of the two IR sensors on the projector will detect the signals and relay the commands for internal processing.

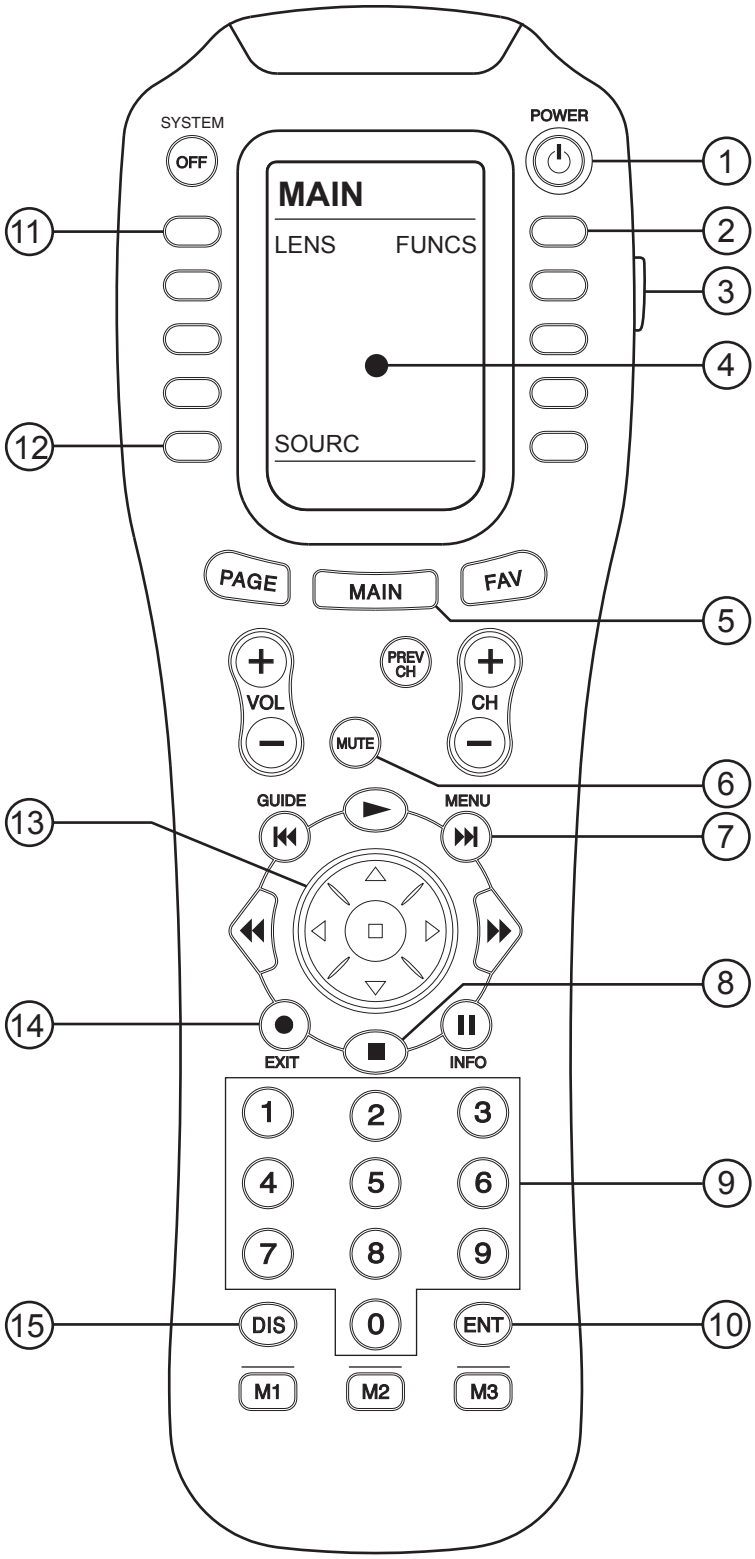


Figure 3.3 Theater Master IR Remote Control

◄ ***Remote Control Button Descriptions***

1. POWER Button
Hold this button down for 1-2 seconds to turn on or off the projector.

2. FUNCS Button
This button brings you to a sub-page in which you can access the projector's internal test patterns, view help text, auto-calibrate the projector and perform various other functions.

3. BACKLIGHT Button
Lights the LCD display and buttons for use in a dark room.

4. LCD Display
Displays currently-selected LCD Menu page.

5. MAIN Button
Brings up the Main LCD Menu page.

6. MUTE Button
Activates the Shutter control on the projector. Press and hold for 1-2 seconds to activate the shutter, and press and hold again to de-activate the shutter.

7. MENU Button
Displays or hides the on-screen projector menu.

8. ENTER Button
Though it has a 'stop' icon (and can be programmed as such for other sources), this button serves as an 'ENTER' button for the projector when navigating through the menus.

9. Numeric Keypad
Used for entering numeric values or passcodes. Also allows direct selection of numbered on-screen menu items.

10. ENTER Button
Same as 8.

11. LENS Button
Brings up the lens adjustment LCD Menu for making zoom, focus and shift adjustments.

12. SOURC Button
Brings up the projector's source selection LCD Menu.

13. Directional Keypad
Used for navigating through the on-screen projector menus and adjusting values.

14. EXIT Button
When in the menu structure, the EXIT button brings the menu back one page or cancels the current function.

15. FUNCTION Button
Though labled 'DIS,' this button has been programmed as a 'FUNCTION' button used in several menu items. (You can also use the FUNCN button in the Functions LCD Menu.)

Guide to Keypads ➤ Keep in mind the following guidelines:

- Press keys one at a time; there are no simultaneous key combinations required.
- Note that two keys, POWER and MUTE, are “press-and hold” keys that do not function with a typical quick press-and-release key press.
- Hold arrow keys down for continuous adjustment/movement in one direction.
- If you press a key while the projector is still responding to the previous action, such as during power-up, the second key press may not take effect.

Specific keypad commands are explained below:

Keypad commands ➤

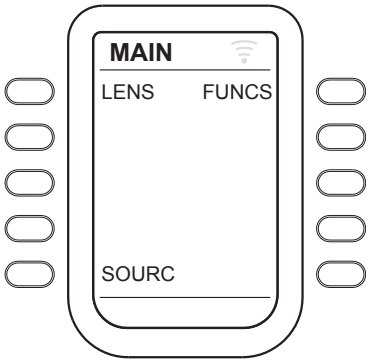
Power ON/OFF

Press *and hold* ⏻ for two seconds to toggle the projector on or off with a single keystroke.

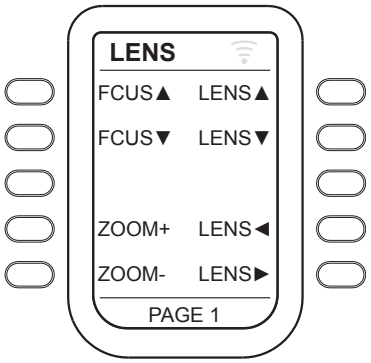
Or press and release ⏻ followed immediately by ▲ (on) or ▼ (off) to guarantee the correct toggle (useful if you are unsure of the present state).

NOTES:
1) *After powering down, the lamp cooling fan remains on for approximately five minutes to cool the lamp.*
2) *Avoid turning the projector back on until it has been off for a few minutes. Hot re-strikes of the lamp may reduce lamp life.*

LCD Menu ➤ The IR remote has its own menu structure, independent of the on-screen menus. The IR remote menus provide convenient shortcuts for selecting the signal source, operating the lens and performing certain other projector functions.



LENS (Focus, Zoom and Lens Shift)
Press **LENS** to adjust the image for focus, zoom and horizontal and vertical positioning. A small window appears on the screen to indicate the type of adjustment taking place.



- **FCUS▲ / FCUS▼**: Use the FCUS▲ and/or FCUS▼ keys to improve image clarity.

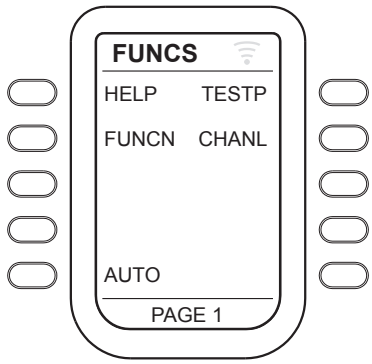
- **LENS▲ / LENS▼**: Use the LENS▲ and/or LENS▼ keys to adjust the vertical position of the image.

- **ZOOM+ / ZOOM-:** Use the ZOOM+ and/or ZOOM- keys to achieve the desired image size.

- **LENS◄ / LENS►**: Use the LENS◄ and/or LENS► keys to adjust the horizontal position of the image.

To shift the lens using the built-in keypad, press the LENS SHIFT button on that keypad, then use the directional buttons (◄►▲▼) to position the image. Press **Exit** when finished.

FUNCS
Press **FUNCS** to access the projector's help text, internal test pattern and "Auto Setup" features.



- **HELP:** Press **HELP** to display on-screen help text. Press **HELP** again (or **Exit)** to hide it.

- **TESTP:** Press **TESTP** and then use the left- and right-arrow keys (or press **TESTP** repeatedly) to cycle in either direction through the test patterns only (no input). Press **Exit** to get out of the test pattern mode.

- **FUNCN:** This is a general-purpose "function" key used in various places throughout the menu system.

  *Note: The **FUNCN** button (on the **FUNCS** sub-page in the LCD menu) and the **DIS** button (next to "0" on numeric keypad) can be used interchangeably.*

- **CHANL:** Press **CHANL** to access the Channel Selection menu. This menu lets you select a specific source setup *(channel)* defined and stored in projector memory. When you enter a 2-digit channel number (or, if there is a list displayed, highlight it and press **Enter**), the display automatically changes and updates according to the numerous setup parameters defined for that channel. Note that a new channel is automatically created if you adjust an image from a new source.

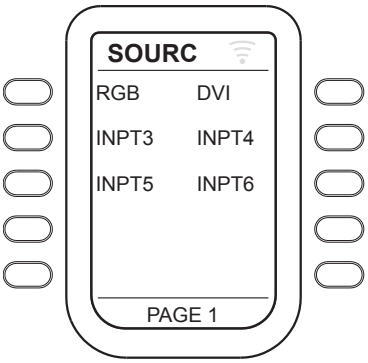
  *NOTE: Channel (CH) key behavior during a presentation depends on whether or not the **Display Channel List** option is enabled in the **Menu Preferences** menu. You can use the scrollable list of channels when you press **CHANL**, or you may prefer to enter the desired channel number "blind;" that is, without on-screen feedback. Refer to **Menu Preferences** later in this section.*

- **AUTO:** Select AUTO to initiate an automated process in which the projector optimizes critical display parameters for the current source. Table 3.1 lists these parameters. An *Auto Setup* allows you to quickly get the image "in the ballpark," after which you can (and in most cases, should) perform further calibration.

Table 3.1 Auto Setup

What an "Auto Setup" Does	
OPTIMIZES:	***SETS TO DEFAULT:***
Pixel Tracking	Contrast
Pixel Phase	Brightness
Size and Blanking	Auto Input Level (off)
Vertical Stretch	Detail *(if video source)*
Position	Filter
Input Levels	Luma Delay

NOTE: You must have an unlocked channel present to use Auto Setup. For more about channels, refer to ***Using Inputs and Channels****, later in this section.*



SOURC
Press **SOURC** to select the desired input signal source:

- **RGB:** Press **RGB** to display from the data or video input source connected to the BNCs at Input 1.

- **DVI:** Press **DVI** to display from the DVI source connected to Input 2.

- **INPT3:** Press **INPT3** to display from the composite video source connected to Input 3.

- **INPT4:** Press **INPT4** to display from the S-video source connected to Input 4.

- **INPT5:** Press **INPT5** to display from the Input 5 interface module installed in the Option 1 slot.

  NOTE: If you have the optional Dual SD/HD-SDI Module installed and there are two inputs connected to it, the second input is considered ***Input 7****. If you are using the built-in keypad or the remote keypad, press* ***INPT5*** *to access* ***Input 7*** *as follows:*

- While displaying from **Input 5**, press INPT5 again. This switches to **Input 7**.

- **INPT6:** Press **INPT6** to display from the Input 6 interface module installed in the Option 2 slot.

  NOTE: If you have the optional Dual SD/HD-SDI Module *installed and there are two inputs connected to it, the second input is considered* ***INPUT 8****. If you are using the built-in keypad or the remote keypad, press* ***INPUT 6*** *to access* ***INPUT 8*** *as follows:*

- While displaying from **Input 6**, press **INPT6** again. This switches to **Input 8**.
- While displaying from any input other than the Dual SD/HD-SDI Module, press Input 6. This switches to either **Input 6** or **Input 8**, depending on which of the *Dual SD/HD-SDI Module* inputs was last used. Press **INPT6** again to display from the other *Dual SD/HD-SDI Module* input.

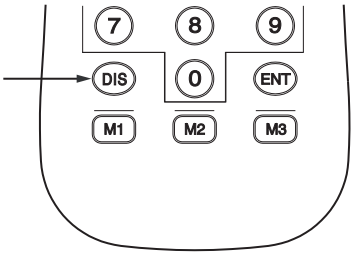
MUTE (Shutter)
Press *and hold* **MUTE** on the Theater Master remote for two seconds to toggle the internal mechanical shutter blade closed or open with a single keystroke.

A closed shutter blanks the display (turns it to black). Close the shutter to mute all display while maintaining access to projector functions. Opening the shutter restores the image.

NOTES:
1) *"Sh" appears in the LED display when the shutter is closed.*
2) *The shutter is open upon power-up.*

Menu
Press **Menu** to enter or exit the projector's menu system.

Function (FUNCN / DIS) Key
Note: The ***FUNCN*** *button (on the* ***FUNCS*** *sub-page in the LCD menu) and the* ***DIS*** *button (next to "0" on numeric keypad) can be used interchangeably.*



IF WITHIN A MENU: Press **FUNCN** to perform special tasks within the menu system, as described with the appropriate topic later in this section. For example, press **FUNCN** while in the Channel Setup menu to delete or copy a channel.

IF WITHIN A PRESENTATION: Press **FUNCN** or **DIS** followed by a 2-digit number to enable a specific color or colors in the display (see right). For example, **FUNCN 6 4** displays only red and green data and **FUNCN 6 7** displays all color data. Eliminating one or more colors can help with certain diagnostics and setups, such as when accurately overlaying one image on top of another from stacked projectors.

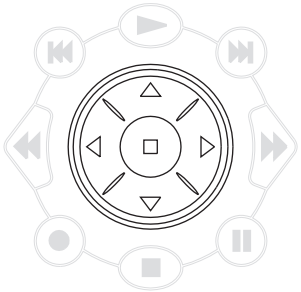
DIS 6 1 = Red
DIS 6 2 = Green
DIS 6 3 = Blue
DIS 6 4 = Red & Green
DIS 6 5 = Green & Blue
DIS 6 6 = Red & Blue
DIS 6 7 = All Colors

NOTE: Color enabling can also be implemented from numerous locations within the menu system.

Enter
Press **Enter** to select a highlighted item, to toggle a checkbox or to accept a parameter adjustment and return to the previous menu or image.

Exit
Press **Exit** to return to the previous menu.

NOTE: Exit does not save changes within text editing boxes (including number editing of a slidebar value) or within pull-down lists. It acts as a "cancel" in these cases.



Directional Keypad
The directional keypad (large, black button just above the numeric keypad) behaves similarly to a joystick.

Press the left or right side of this button to change a slidebar value or to select a different option within a pull-down list without having to first scroll through options. (Also refer to *Editing Text,* later in Section 3.) Press the top or bottom of this button to navigate within a menu, pull-down list or text box.

3.3 Navigating the Menus

Most of the controls for the projector are accessed from within the projector's menu system. There are several groups of related functions, with each group selectable from the Main Menu, shown in Figure 3.4. Press **MENU** at any time to display this menu.

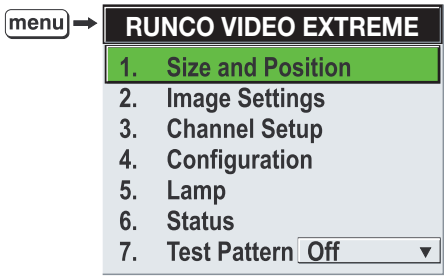


Figure 3.4 Runco Video Extreme Main Menu

On the remote keypad, do one of the following:

- Enter the number corresponding to the function menu you wish to access, such as **2** for the *Image Settings* menu.
- Press ▲ and/or ▼ on the directional keypad to highlight the desired option, then press **Enter** or ►.

The corresponding function menu or pull-down list of further options will then appear.

You navigate the function menus in a similar manner: enter a menu option number for any numbered option, or use the ▲ and ▼ keys to highlight the desired option, then press **Enter**. Extra long menus have a scroll bar on the right; use the arrow keys to access the remainder of the menu. Locked items or items that do not pertain to the current action or condition appear dimmed and cannot be selected.

NOTES:
1) *If there is no signal present, all source-dependent adjustments are disabled.*
2) *After 15 minutes of inactivity, the projector leaves the menu system and returns to the presentation.*
3) *The* ***Status*** *menu is read-only.*

When finished with a function menu, do one of the following:

• Press **Exit** to return to the previous screen.

• Press **MENU** to leave the menu system and return to the presentation.

If at any time you are uncertain what to do next, press **HELP** to display summary information about the current menu or highlighted option; see Figure 3.5. Press **HELP** again to exit. In addition, a line of "hint" text is included at the bottom of some menus.

➤ ***Help***

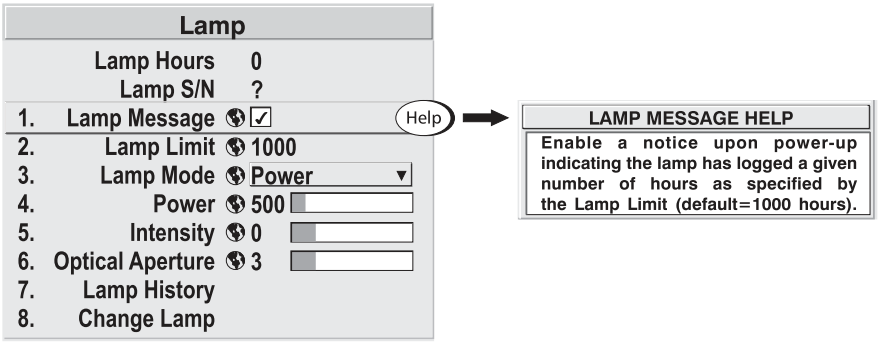

Lamp
Lamp Hours 0
Lamp S/N ?
1. Lamp Message ☑
2. Lamp Limit 1000
3. Lamp Mode Power
4. Power 500
5. Intensity 0
6. Optical Aperture 3
7. Lamp History
8. Change Lamp
Help
LAMP MESSAGE HELP
Enable a notice upon power-up indicating the lamp has logged a given number of hours as specified by the Lamp Limit (default=1000 hours).

Figure 3.5 Context-sensitive Help

From presentation level, press **HELP** to access general *Help Topics* (Figure 3.6). Scroll as necessary within a topic. Press **HELP** or **Exit** to return to your presentation.

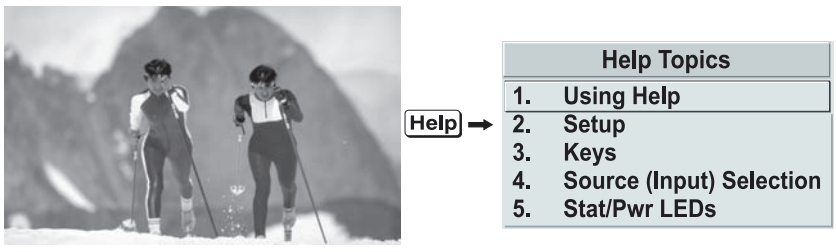


Figure 3.6 Accessing General Help Topics

If a slidebar, menu or message is displayed you have limited time in which to make a keypad entry before the projector returns to presentation level and the graphic disappears. These time-outs may vary depending on what is displayed.

➤ ***Time-outs***

Menu options that include this icon apply universally to any incoming signal.

➤ ***The Global Icon***

Using Slidebars and Other ➤ Controls

Most of the function menus allow you to change settings by using slidebars, checkboxes and pull-down lists. To select a slidebar, toggle a checkbox status or view a pull-down list, do one of the following within the function menu:

- Enter the menu option number corresponding to the setting you wish to change (for example, press **MENU 1 3** to select Vertical Stretch in the *Size and Position menu)*.
- Move the highlight to the option desired and press **Enter**.
- Move the highlight to the option desired and press ◄ and/or ► to adjust immediately.
- Bypass the menus entirely and use a single key to immediately access an adjustment during your presentation. This applies only to options having their own key, such as Focus (**FCUS**) or Zoom.
- For "blind" access, hide the entire menu system (see OSD key, above) and/or direct slidebars activated by their own key (such as Contrast, Brightness, etc.). Control by using the proper keypress or numerical sequence of key presses.

Once selected, change the setting as desired and press **Enter** to save and return to the current function menu.

Slidebars in menus — The current value for a given parameter, such as size or vertical stretch, appears to the left of its slidebar icon (adjustment window). This number often expresses a percentage, or it may have units associated with it (such as pixels or kelvin), depending on the specific option. Press ◄ ► to gradually adjust the setting up or down—both the number and the length of the bar change accordingly. Hold for continuous adjustment. Or, press **Enter** to activate a slidebar text box for specific number entry via the keypad, then press **Enter** to save or **Exit** to cancel.

Checkboxes — Conditions are present if its adjacent checkbox contains a checkmark. To toggle the checkbox, highlight it and press **Enter**, or highlight and use ► to check and ◄ to uncheck. If a checkbox is numbered, simply enter its number to immediately toggle the checkbox.

Pull-down lists — To see a pull-down list of options available for a given parameter labeled with a ▼, highlight it and press **Enter**, or enter the menu option number.

Use ▲ or ▼ keys to navigate up and down within the list (the current choice is noted with a small ►). Press **Enter** to choose an option from the list.

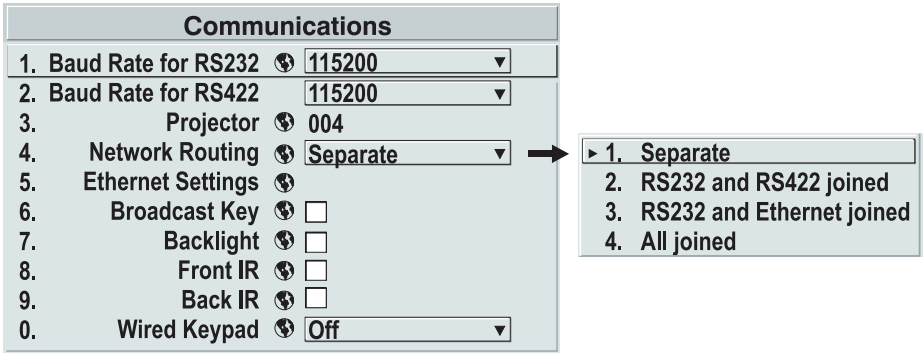


Figure 3.7 Example of Pull-Down List

If you prefer to quickly scroll through a list without first pulling it down, highlight the option and use ◄ or ►. Press **Enter** when the desired choice appears.

NOTES:
1) *Long pull-down lists consist of two or more "pages." To jump between pages, press ◄ or ►.*
2) *Press Exit while in a pull-down list to* ***cancel*** *any change.*

◄ *Editing Text*

ACTIVATE THE EDIT WINDOW: To enter or edit text, highlight the desired parameter (such as a channel name) and press **Enter** to activate its adjacent edit window. Any previously entered text is displayed with its first character highlighted in a square cursor, signifying that this character is ready for editing.

NAVIGATE WITHIN THE EDIT WINDOW: Press ► to move the cursor forward or ◄ to move the cursor backwards as desired.

EDIT A CHARACTER: To edit a highlighted character, use ▲ and ▼ to scroll through the alphabet, numbers, spaces and punctuation available. When the character you need appears, press ► to select it — the cursor will move to the next character of current text, if present. Note that you can also enter a number directly from the keypad — it will be accepted and the cursor will move on.

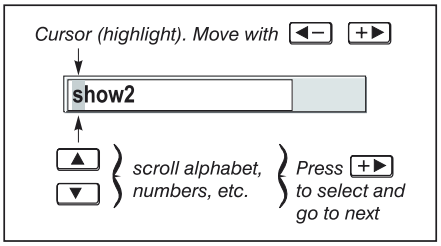
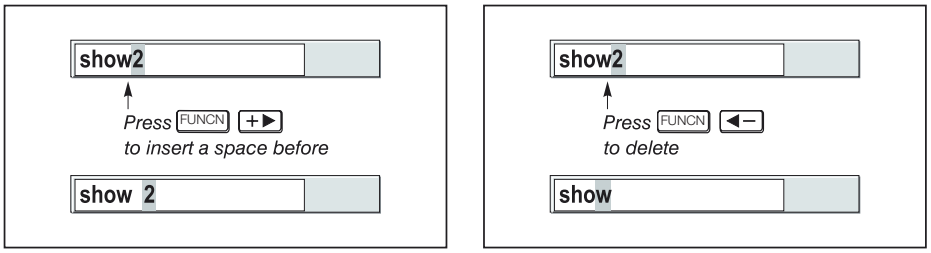


Figure 3.8 Entering Text

INSERT A SPACE OR DELETE A CHARACTER: To insert a space at the cursor location, press **FUNCN** (or **DIS**) followed by ►. To delete a highlighted character (or space), press **FUNCN** followed by ◄.



PRESS ENTER WHEN FINISHED: To accept edits and leave the edit window, press **ENT** (**Enter**). To cancel changes and return to the previously-defined text, press **Exit** at any time.

◄ *Editing Numerical Values*

Enter numbers directly from the keypad in order to specify numbers representing projectors, channels (source setups) or slots. As each digit is entered, it is displayed and the cursor moves on. Note that channel numbers are defined with 2 digits—for example, if you enter only a single digit (such as "7") for a channel number, the channel will automatically be defined as "07". Enter "07" to utilize this channel.

NOTES:
1) *Once you enter the first digit, this digit replaces all old digits.*
2) *If you press any non-numbered key, the number entered up to that point is accepted and updated as the new value.*
3) *Press* ***Exit*** *to cancel editing of numerical values.*

3.4 Using Inputs and Channels

*NOTE: See **Section 2, Installation and Setup**, for details on connecting sources to the projector.*

The projector stores and automatically recalls up to 50 different channels (source setups) for a variety of inputs. This memory feature allows you to define and conveniently use a wide variety of customized setups rather than having to repeatedly re-configure the projector for different presentations. Each physical source connection (i.e., input at the projector) can have several different channels associated with it.

NOTE: Channels are pre-configured at the Runco factory for use with the DHD Controller, and do not necessarily need to be changed. The following information applies only if other sources are connected directly to the projector.

Do I Select an Input ➤ or a Channel?

INPUT — An input is a source physically connected at the projector. Input describes the source signal according to which *input slot* it is connected.

SWITCHING INPUTS — Press **SOURC** followed by the appropriate "direct" key (RGB, **DVI**, **INPT3**, **INPT4**, **INPT5** or **INPT6**) to quickly display from one of the six inputs connected. The image will be displayed according to the following:

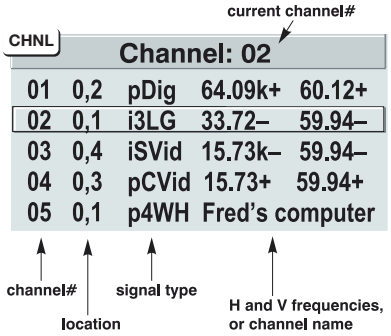
> ***If it is the first time you have used the source/input*** (or if you used the input but did not define a channel by adjusting anything), the projector will recognize the new input signal based on its frequencies and polarities, and will automatically display an image according to default settings for such a signal. In general, the image from the new source will be as large as possible without losing its aspect ratio. This and other default image settings depend on the incoming source.
>
> ***If you used the source once before and changed a display parameter*** such as contrast, V-Position, etc., then a channel was automatically created and still exists in projector memory (see below). Using one of the Input keys will automatically recall this channel—and all its setup parameters—and update the display accordingly.
>
> ***If more than one channel exists*** for the input, the image will be displayed according to the setup parameters for the first channel with matching characteristics.

NOTE: Inputs 7 and 8 require the Dual SD/HD-SDI module in either of the projector's option slots. For their selection, see also 3.2, Using the Remote or Built-In Keypad.

CHANNEL — A channel is a collection of measurements, locations and settings that tailor the display of a signal to your specific needs. Since source types and applications can vary greatly, you will likely want to adjust and define a wide variety of parameters, such as brightness, contrast, size etc., in order to customize and optimize the display from or for a particular source. For example, the display settings you choose for a VCR source may be very different from those you choose for a high resolution computer source, or one signal may simply vary from another signal used previously through the same input location. Once you have adjusted a display parameter, such as pixel tracking or contrast, all current settings are collectively stored in the projector's memory as a unique 2-digit channel, such as 0 9. You can have numerous distinct channels available for the same input, any of which can be selected by pressing **FUNCS** then **CHANL** on the keypad, followed by the two-digit channel number.

Shown at right is a sample channel list.

NOTE: The Channel key may display a channel list or not, depending on the current "Display Channel List" setting (refer to ***Menu Preferences*** *later in this section).*



Channel List

➤ *Creating a New Channel – AUTOMATIC –*

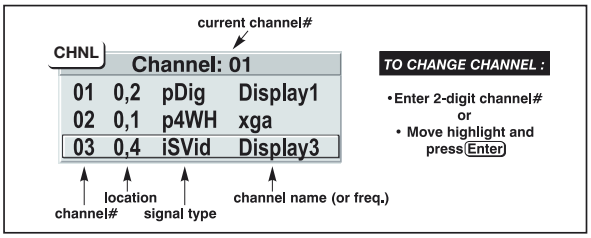
To use a new source with the projector, you must add a new channel to projector memory so that the projector will respond properly to an input signal from that source in the future. A new channel can be created automatically, as described here, or it can be copied from an existing channel and then edited as necessary (see *Copying or Deleting Channels* later in this section).

When you select a direct input (**RGB**, **DVI**, **INPT3**, **INPT4**, **INPT5** or **INPT6**) any existing channels in the projector are searched for matching input and signal parameters – this only occurs if Auto Source is enabled on these channels. If no match to the incoming input signal is found in currently-defined channels, a new channel is temporarily created based on factory-defined defaults for this type of signal. The channel number assigned is the lowest available number from 01 to 50.

NOTES: ***1)*** *An automatic channel will be discarded unless one or more of its parameters are changed and will not appear in the channel list (see below).* ***2)*** *If two channels have the same distinguishing source characteristics except for the reversal of sync connectors (i.e., H-sync and V-sync, are switched), they are still defined as distinct channels.* ***3)*** *You cannot define a new channel without an incoming signal.*

If the incoming signal *does* match an existing channel, the image will be set up and displayed as usual according to the parameters currently defined for that channel.

USING A CHANNEL: You can normally select a channel at any time by pressing **CHNL** (see right). If you want to prevent a channel from appearing in this list, you must edit the channel as described in *Channel Edit* later in this section. Such a channel can still be selected by entering its number as shown at right.



NOTES: **1)** *The current channel is highlighted upon entering the channel list, or, if this channel is not displayed here, the first channel in the list is highlighted.* **2)** *Channels created automatically do not appear in the channel list unless a parameter for the channel has been changed.*

What Channels ➤ Are Defined So Far?

All available channels are listed in the *Channel Setup* menu, which describes how each channel can be accessed and which serves as the gateway for editing, copying and deleting channels.

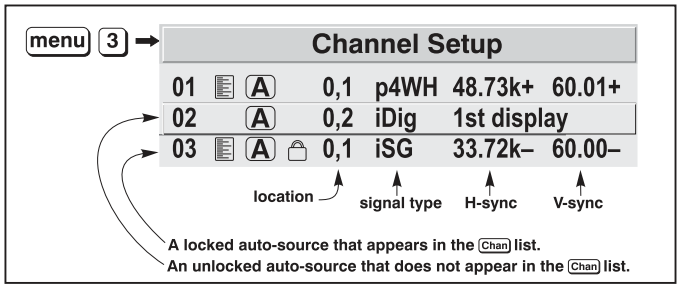
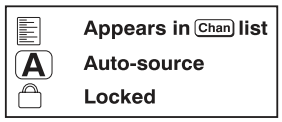

menu 3
Channel Setup
01 A 0,1 p4WH 48.73k+ 60.01+
02 A 0,2 iDig 1st display
03 A 0,1 iSG 33.72k– 60.00–
location
signal type
H-sync
V-sync
A locked auto-source that appears in the Chan list.
An unlocked auto-source that does not appear in the Chan list.

Figure 3.9. Typical Channel Setup Menu

From the presentation level, press **MENU** to display the Main Menu. To display the *Channel Setup* menu, press 3 or highlight *Channel Setup* and press **Enter** or ►. The *Channel Setup* menu appears with the active channel highlighted.

WHAT APPEARS IN CHANNEL SETUP MENU? This menu lists all channels defined so far and indicates where they are connected on the input panel. The far left column lists channel numbers currently defined. The values in the far right columns indicate horizontal and vertical frequencies—if someone has defined a name for this channel, it appears here instead. Remaining columns contain details pertaining to each channel setup, such as its switcher number (always 0 = projector), slot location, a variety of icons indicating access to each channel, and an abbreviated description of each signal type. Refer to *Editing a Channel Setup* for details.



NOTE: If you have more than a handful of channels, use ◄ and ► to see the remaining channels not visible in the initial display of channels.

SIGNAL TYPE — Either channel list, whether the Channel key list or the *Channel Setup* menu, identifies signal types in a shortened form, as shown in Table 3.2. These descriptors indicate what signal information the projector uses to identify a match for a given channel, and are preceded by either an "i" (for interlaced signals) or "p" (for progressive signals).

Table 3.2. Signal Type Abbreviations

Abbrev.	*Signal Type*
4WH	*Composite (4 wire) on HC input*
4WV	*Composite (4 wire) on V input*
SG	*Sync-on-green*
5W	*Separate H,V*
5WR	*Separate H,V swapped*
SVid	*S-Vid*
CVid	*Composite Video*
Dig	*Digital*

FUNCTIONS WITHIN THE CHANNEL SETUP MENU — To copy, delete or edit a channel, highlight the desired channel in the Channel Setup menu and either:

- Press **FUNCN** (or **DIS**) if you want to copy the selected channel or delete this or other channels (refer to *Copying or Deleting a Channel,* below); or
- Press **Enter** if you want to edit channel setups (i.e., non-image related parameters) for the selected channel. Refer *Editing a Channel Setup*.

TO COPY A CHANNEL, highlight the desired channel in the Channel Setup menu, then press **DIS** to go to the Channel Copy/Delete submenu. Select "Copy" and press **Enter.** This creates a new channel that is identical to original -- which remains -- but it is identified with the next available number from 01 to 50. If you change your mind and do not want to copy the current channel, press **Exit** to cancel and return to the previous menu. Copying channels is a quick way to create numerous channels, each of which can then be edited and adjusted for a variety of presentations in the future.

➤ ***Copying or Deleting Channels***

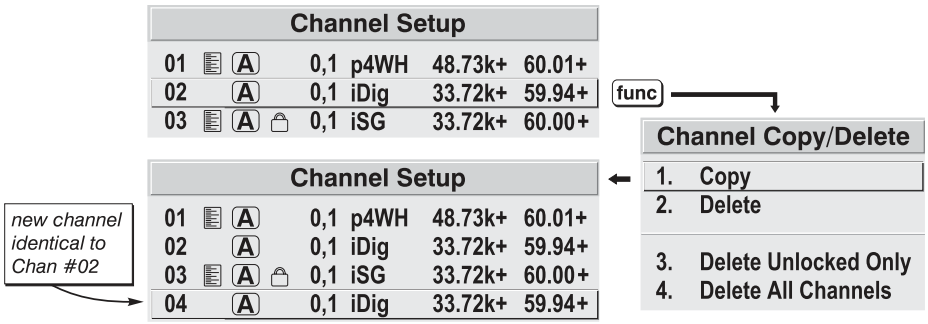

Channel Setup
01 A 0,1 p4WH 48.73k+ 60.01+
02 A 0,1 iDig 33.72k+ 59.94+
03 A 0,1 iSG 33.72k+ 60.00+
func
Channel Copy/Delete
1. Copy
2. Delete
3. Delete Unlocked Only
4. Delete All Channels
Channel Setup
01 A 0,1 p4WH 48.73k+ 60.01+
02 A 0,1 iDig 33.72k+ 59.94+
03 A 0,1 iSG 33.72k+ 60.00+
04 A 0,1 iDig 33.72k+ 59.94+
new channel identical to Chan #02

Figure 3.10. Copying A Channel

TO DELETE A CHANNEL, highlight the desired channel in the *Channel Setup* menu, then press **DIS** to activate the *Channel Copy/Delete* submenu. Select "Delete" and press **Enter**. A confirmation window appears. Press **Enter** again to confirm the deletion or select **Cancel** if you change your mind.

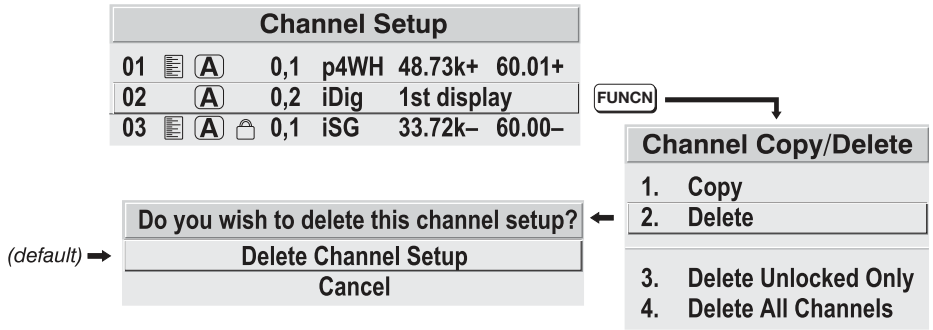


Figure 3.11. Deleting a Channel

TO DELETE MULTIPLE CHANNELS, highlight any channel in the *Channel Setup* menu and press **DIS** (or **FUNCN**) to go to the *Channel Copy/Delete* submenu. Select "Delete Unlocked Only" and press to delete all unlocked channels. Or select "Delete All Channels" to delete all channels, even those that are locked. In either case, the current channel will remain but will be redefined from projector defaults.

NOTE: For any deletion, a confirmation box appears to make sure that you really want to delete. Select "Cancel" (default) if you don't want to delete after all.

Editing a Channel Setup ➤ The basic setups that describe how and where a channel can be accessed are listed in the *Channel Setup* menu. These channel setups can be edited at any time in the *Channel Edit* submenu.

CHANNEL EDIT — STEP 1 From the presentation level press **MENU** to display the main menu. To display the *Channel Setup* menu, press 3, or move the highlight to the *Channel Setup* option and press **Enter** or ►. The *Channel Setup* menu will appear.

CHANNEL EDIT — STEP 2 To edit parameters shown in the *Channel Setup* menu, select the relevant channel and press **Enter** or ►. The *Channel Edit* menu, shown in Figure 3.12, appears.

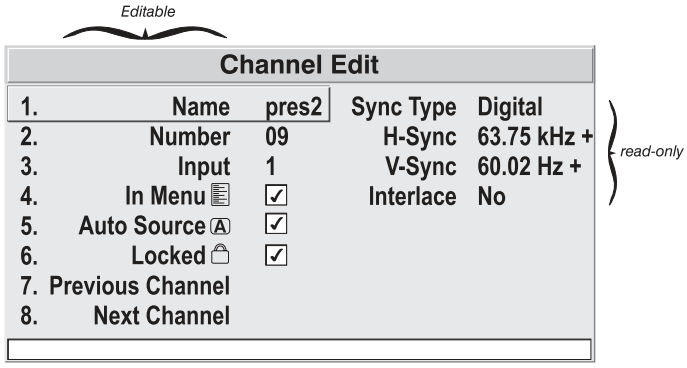


Figure 3.12. Typical Channel Edit Menu

CHANNEL EDIT — STEP 3 If desired, review and/or edit the following channel setups in the Channel Edit menu:

- **CHANNEL NAME:** An alpha-numeric label can be defined and/or changed here. Channel names can be up to 12 characters in length.
- **CHANNEL NUMBER:** A 2-digit channel number can be changed here.

  *NOTES: **1)** If you enter a channel number that already exists, a dialog message appears indicating that this number is already in use–assign a different channel number. **2)** You can define up to 50 channels.*

- **INPUT:** 1-8, corresponding to where on the projector's input panel the source is connected.
- **IN MENU*:*** If checked (default, except for automatically defined channels with unchanged parameters), this defined channel will then appear in the list available when **CHANL** key is pressed. If unchecked, the channel must be accessed via **CHANL** on the keypad or via the Auto Source function.

  NOTE: To enable or disable on-screen display of the Channel List, use the Menu Preferences *menu (described later in this section).*

- **AUTO SOURCE:** If checked, (default), the projector can automatically locate this channel when an incoming input signal matches. If not checked, the projector can locate the selected channel only when it is directly selected via **CHANL** on the keypad—and a change in input signal will not result in a channel change.
- **LOCKED:** If checked, all of the image settings for this channel are disabled. If unchecked (default), all available image settings can be adjusted as desired. You cannot use Auto Setup with a locked channel.
- **PREVIOUS CHANNEL:** Select this option to see or change Channel Edit settings for the previous channel in the Channel Setup list.
- **NEXT CHANNEL:** Select this option to see or change Channel Edit settings for the next channel in the Channel Setup list.

3.5 Adjusting the Image

The most commonly used options for image adjustments are accessed through two menus: *Size and Position* (**MENU 1**) and *Image Settings* (**MENU 2**), both of which appear in the Main menu. From either of these two menus, you can change settings affecting the image from the current channel by working with the appropriate slidebars, checkboxes and pull-down lists. Exit will return to the previous menu (or to the presentation, if from the Main menu) and accept any changes you may have entered. Settings are saved with the current channel.

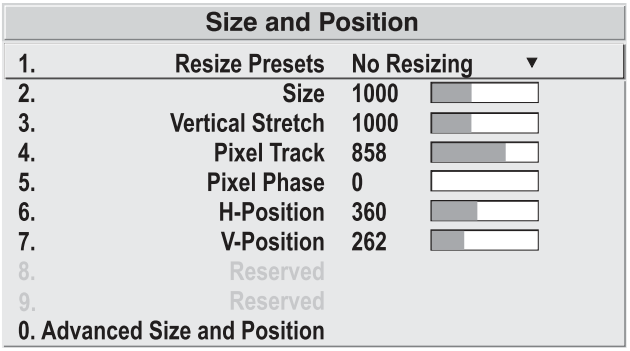
From your presentation, you can access any of the individual options in these menus by pressing **MENU** followed by the appropriate two-digit number representing their location in the menu system. For example, press **MENU 2 3** to quickly access the “Gamma” option in the Image Settings menu.

Use Auto Setup (AUTO)

➤ ***Before You Begin***

For a good and efficient first step in perfecting the image, press **FUNCS** followed by **AUTO** on the remote control. This initiates an automated process in which the projector quickly optimizes critical display parameters such as size, position and pixel tracking, based on the type of incoming source data detected. An *Auto Setup* can save considerable setup time, and you can still modify the adjustments as desired using menu options described below.

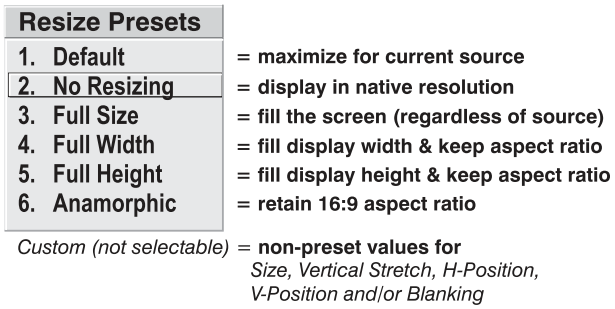
Size and Position Menu ➤ In the Size and Position Menu, you can increase or decrease the size of your image, change its proportion (aspect ratio), move the image to a specific area of the screen, and refine other related parameters. Use Size and Position controls to match the image precisely to the screen used at the site.



Refer to *Using Slidebars and Other Controls* (earlier in this section) if you need help using any of the options and controls. Changes made in the Size and Position menu take effect immediately and are saved when you exit the menu (press **Exit** or **MENU**).

Resize Presets

Select a Resize Presets option to quickly display an image in its native resolution or to automatically resize an image to closely fill the projector's native resolution of 1400 x 1050, or to optimize the width or height of your display. Size, Position and Blanking parameters will automatically adjust accordingly, or if Blanking is set first, which defines an Active Input Area, Resize Preset scaling will occur in this region of interest only. Resizing options are explained in detail below.


Resize Presets
1. Default = maximize for current source
2. No Resizing = display in native resolution
3. Full Size = fill the screen (regardless of source)
4. Full Width = fill display width & keep aspect ratio
5. Full Height = fill display height & keep aspect ratio
6. Anamorphic = retain 16:9 aspect ratio
Custom (not selectable) = non-preset values for Size, Vertical Stretch, H-Position, V-Position and/or Blanking

WHAT IS THE RESIZING DEFAULT? By default, when you select a new source, the image utilizes as much of the projector's display area (1400 x 1050) as possible for the type of incoming source data, but with minimal or no changes to aspect ratio. See *Select "Default,"* below.

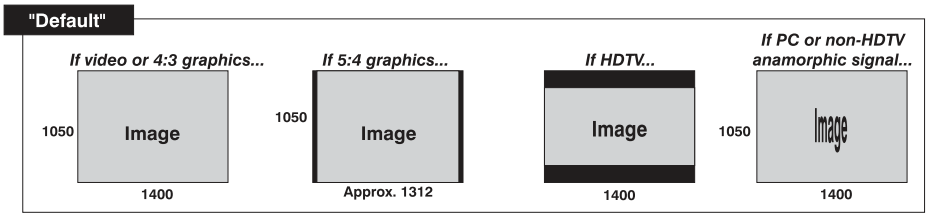
WHEN "CUSTOM" APPEARS: The "Custom" re-size descriptor automatically appears in the Size and Position menu when any of the values for Size, Vertical Stretch, H-Position, V-Position or Blanking do not correspond to those for a preset. This option is not offered in the Resize Presets pull-down list.

- Select **"DEFAULT"** for most sources (factory default). The image will be centered and displayed as large as possible depending on the type of source, as described below:

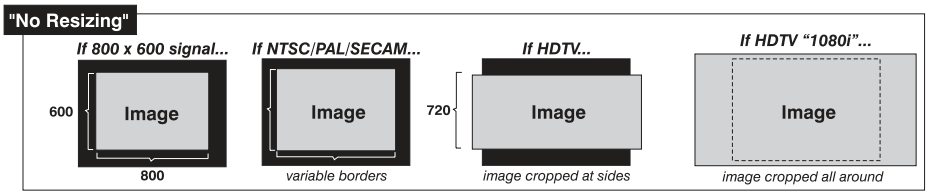
  ✔***A 5:4 graphic image*** will enlarge to fill the screen height, and be centered between narrow black side bars.

  ✔***A video image*** or 4:3 graphic image will enlarge to fill the screen.

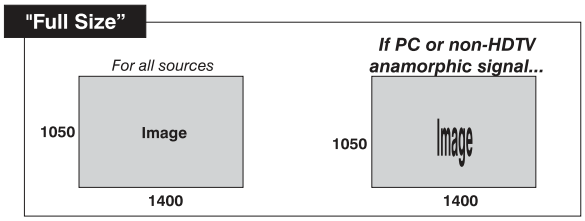
  ✔***An anamorphic (16:9) image*** will fill the width and be centered between black bars on top and bottom.

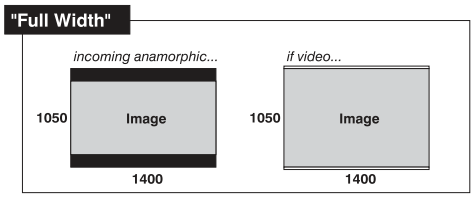


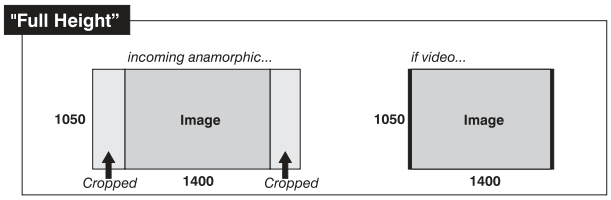
- Select **No Resizing** to display the image in its native resolution, which may or may not match the projector's 1400 x 1050 resolution. For example, for a source with a native resolution of 800 x 600, "No Resizing" will use the central 800 x 600 pixels and have a black border—the black border areas are unused areas.



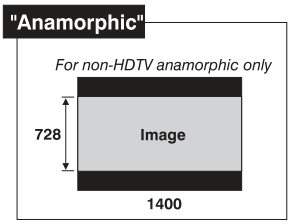
- Select **Full Size** to use all pixels (1400 x 1050) for displaying the image, regardless of source or original aspect ratio. Incoming source material having a different aspect ratio than the projector will be stretched for display.
- Select **Full Width** to fill the projector's display from left-to-right without changing the original aspect ratio of the image. Depending on the source, data at the top and bottom may be discarded (cropped), or the display may have black borders at the top and bottom (called "letterbox").
- Select **Full Height** to fill the display from top-to-bottom. Depending on the source, this may create borders.







- Select **Anamorphic** to display an anamorphic image in its native 16:9 aspect ratio. The image will fill the screen from side-to-side and be centered between black bars at top and bottom.



NOTE: If using a 16:9 screen, you may have to go to the Anamorphic mode after performing an auto setup.

Size

"Size" controls both the image *width* and *height* in tandem, maintaining the current aspect ratio (proportion) of the displayed signal data.

Vertical Stretch

"Vertical Stretch" adjusts the *height* of the image while keeping the width constant. Use Vertical Stretch to change the aspect ratio of the display.

Pixel Track

Steady flickering or several soft vertical stripes or bands across the entire image indicates poor pixel tracking. Proper pixel tracking helps ensure that the image quality is consistent across the screen, that aspect ratio is maintained, and that pixel phase can be optimized (described below). Tracking determines the frequency of the pixel sampling clock, indicated by the number of incoming pixels per line, so that all pixels generated by a particular source are sampled.

NOTE: By default, the projector samples at the correct frequency for most sources.

For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar "half on, half off" graphic image, such as the *Windows* shutdown screen. Adjust the slidebar until the vertical stripes broaden to the point where one large stripe fills the image. If the image still exhibits some shimmer or noise, adjust *Pixel Phase* (below).

Pixel Phase

*NOTE: Adjust "Pixel Phase" **after** "Pixel Tracking".*

Adjust pixel phase when the image (usually from an RGB source) still shows shimmer or "noise" after pixel tracking is optimized. Pixel phase adjusts the phase of the pixel sampling clock relative to the incoming signal.

For best results, use a good test pattern such as a smooth gray consisting of a clear pattern of black and white pixels, or a similar "half on, half off" graphic image, such as the *Windows* shutdown screen. Adjust the slidebar until the image stabilizes and each pixel is clearly defined. You may notice that you can stabilize the image at more than one point — that is, you may find that the image appearance at "11" is identical to the image appearance at "38," thus you can use either setting.

If some shimmer from a video or HDTV source persists, use the "Filter" control in the *Image Settings* menu (described later) to remove high-frequency noise from the signal.

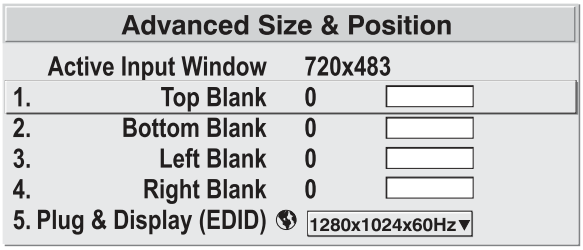
H-Position
This option moves the image right or left within the area of available pixels.

NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available horizontally. This varies widely according to the signal—watch the image while adjusting.

V-Position
This option moves the image up or down within the area of available pixels.

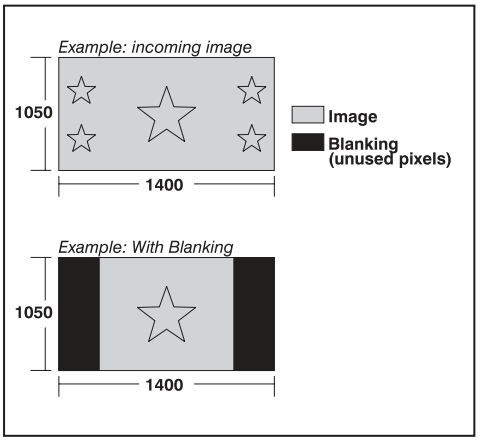
NOTE: The value shown represents where the approximate center of the image lies in relation to the total number of pixels available vertically. This varies widely according to the signal—watch the image while adjusting.

Advanced Size and Position — SUBMENU
This submenu consists of the following options:



ACTIVE INPUT WINDOW: This read-only value indicates the current size (i.e., area) of your displayed data or "region of interest" as defined by the blanking controls. By default, the projector automatically determines what portion of its full resolution to use, and pixels in the surrounding borders are turned off. You can also specify a specific active input window size by adjusting one or more "Blank" settings. For example, if you have blanked (cropped) 100 pixels from both the left and right edges of an incoming source of 1400 x 1050, the remaining active input window will be reduced to 1200 x 1050. When using SD or HD, or a decoded video source at **INPUT 3** (Composite) or **INPUT 4** (S-Video), the default blanking of "0" defines an active input window of 720 x 483.

BLANKING (TOP, BOTTOM, LEFT, and RIGHT): Crop the image as desired so that unwanted edges are removed from the display (changed to black—see right). Blanking defines the size of the *Active Input Window*, or area of interest. The range of adjustment depends on the source resolution and other factors.



PLUG & DISPLAY (EDID): By default, a *Plug & Play (EDID)* source outputs a signal according to the EDID information provided by the projector. To override this information and display in a different format (for example, if your *Plug & Play [EDID]* device does not support the projector's resolution and/or frequency), select the desired *Plug & Play (EDID)* resolution from the list.

Any daisy-chained projectors will also display according to the chosen *Plug & Play (EDID)* format.

EDID = Extended Display Identification Data standard.

1. 1024x768x60Hz
2. 1024x768x120Hz
▸ 3. 1280x720x60Hz
4. 1280x1024x60Hz
5. 1280x1024x105Hz
6. 1400x1050x60Hz
7. 1600x1200x45Hz
8. 2048x1080x60Hz
9. 1080i 60Hz
0. 720p 60Hz
480p 60Hz
1080p 60 Hz
1080p 50 Hz
1080p 24 Hz

Image Settings Menu ➤

Use options in the *Image Settings* menu to alter your image without affecting its size or position. Changes made to the *Image Settings* menu are applied immediately and are saved when you exit the menu (press **EXIT** or **MENU**). Options not available for the projector model or source are disabled and appear dim (gray).

Image Settings

1.	Contrast	50.0	
2.	Brightness	50.0	
3.	Gamma	2.2	
4.	Filter	Off	▼
5.	Detail	0	
6.	Noise Reduction	0	
7.	Color Space	YPbPr	▼
8.	Video Options		
9.	Input Levels		
0.	Advanced Image Settings		

Contrast
"Contrast" increases or decreases the perceived difference between light and dark areas of your image (0-100). For best results, keep it under 50. If contrast is set too high, the light parts of the image lose detail and clarity. If set too low, the light areas will not be as bright as they could be and the overall image will be dim. For best results, start with a low value and increase so that whites remain bright but are not distorted or tinted and that light areas do not become white (i.e., are "crushed").

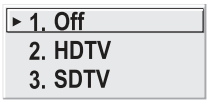
NOTE: If the environment lighting changes, an adjustment of Gamma *is recommended (see below).*

Brightness
"Brightness" increases or decreases the amount of black in the image (0-100). For best results, keep close to 50. Start with a high value and decrease so that dark areas do not become black (i.e., are "crushed"). Conversely, high brightness changes black to dark gray, causing washed-out images.

Gamma
"Gamma" is a global setting that determines how gray shades are displayed between minimum input (black) and maximum input (white) for all signals. A good gamma setting helps to optimize blacks and whites while ensuring smooth transitions for the "in-between" values utilized in other grays. Unlike the Brightness and Contrast controls, the overall tone of your images can be lightened or darkened without changing the extremes and all images will be more vibrant while still showing good detail in dark areas when using the "Gamma" control.

The normal gamma setting of 2.2 is correct for virtually all signals and conditions. If excess ambient light washes out the image and it becomes difficult or impossible to see details in dark areas, lower the gamma setting to compensate. This will improve contrast while maintaining good details for blacks. Conversely, if the image is washed out and unnatural, with excessive detail in black areas, increase the setting. Again, good gamma improves contrast while maintaining good details for blacks and whites.

Filter



The proper filter setting is automatically set for virtually all signals, and rarely needs to be changed. It applies a low pass filter for noise reduction in the incoming input signal, particularly for HDTV or SDTV. Applied in the analog domain before sampling, this filtering removes high frequencies and thus reduces pixel phase noise (note this also reduces signal bandwidth). Override only if standard pixel tracking and phase adjustments do not adequately clear up a "noisy" video signal, or if a graphics signal appears overly "soft". Both instances indicate that "Filter" may be set to the wrong option.

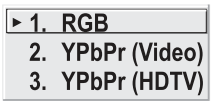
Detail

"Detail" adjusts the sharpness of a video image so that edges remain clearly defined. It can be particularly useful if a significant "Noise Reduction" adjustment has caused the image to appear too soft. Adjust until the display is as sharp as desired, keeping in mind that because "Detail" adds some high frequencies back into the image, it can also re-introduce a certain degree of noise.

Noise Reduction

"Noise Reduction" is similar to the "Filter" control, but operates in the post-sampling digital domain with a more subtle effect. Higher settings are most useful for clearing up noisy RGB images such as those from a PC. Adjust as desired, keeping in mind that reducing noise (which reduces high frequencies) may also soften the image.

Color Space



"Color Space" determines how the color components of an analog input signal are decoded for accurate color in the display. Selecting a color space option is useful only for analog signals connected to **INPUT 1**, **INPUT 2**, **INPUT 5** or **INPUT 6**. Although color space for these analog signals is automatically determined by the projector, in some circumstances you may wish to override this and manually set a specific color space.

*NOTE: For digital signals or for signals connected to **INPUT 3** or **INPUT 4**, the color space function is entirely automatic and the pull-down list disabled.*

The current color space appears in the Image Settings menu. Press **7** (or highlight **Color Space** and press **Enter**) to select a different option:

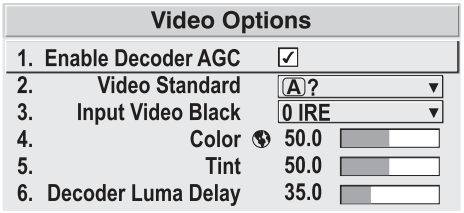
- Select **RGB** unless you are using component video at **INPUT 1**, **2**, **5** or **6**.
- Select **YPbPr (Video)** with a standard definition televised signal (SDTV)
- Select **YPbPr (HDTV)** with a high definition televised signal (HDTV).

NOTE: When certain RGB signals are first connected, the projector may not initially recognize them as RGB and will incorrectly decode their color information as YPbPr (video). These signals, which appear magenta, can include:

- *RGB signals in NTSC, PAL, SECAM frequency ranges*
- *Scan-doubled sync-on-green*
- *Scan-quadrupled sync-on-green*

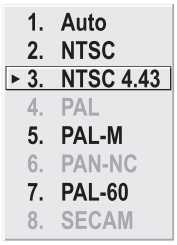
*For these signals, change the Color Space to **RGB**.*

Video Options — SUBMENU
This submenu is used with video sources only (**Input 3** or **Input 4**).



ENABLE DECODER AGC: Automatic Gain Control (AGC) affects decoded video images only. Enter a checkmark (default) in most instances—this activates the decoder's AGC circuit to ensure properly bright images. Delete the checkmark if a decoded video image exhibits strange color artifacts such as stripes in highly saturated colors, indicating an incompatibility between this source and the AGC.

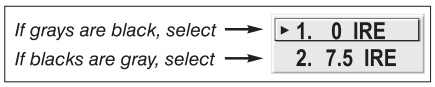
VIDEO STANDARD: For all but the more unusual video standards available in the world, the projector automatically detects the incoming horizontal and vertical frequencies and sets the projector's processing of this signal to the corresponding standard. The current video standard name appears in the *Video Options* submenu, and includes an "A" if it has been auto-detected. Press **Enter** to view or select a different video standard from those available to the projector—any that are disabled have frequency characteristics that differ from those of the incoming signal. Selecting a specific standard forces the projector to process the signal according to this standard.



Standard	Where Used (SUBJECT-TO-CHANGE)
NTSC	N. America and Japan
NTSC 4.43	A tape-only standard for partially-translated hybrid signals
PAL	Most of Europe, China, Australia, some of S. America, some of Africa
PAL-M	Brazil
PAL-NC	Argentina, Chile, other Latin American countries
PAL 60	
SECAM	France, Eastern Europe, most of Africa

NOTE: Generally, use "Auto" for all instances EXCEPT: 1) a poor quality input signal or 2) a black-and-white video signal. In order to detect and display such signals, select the relevant standard from the list.

INPUT VIDEO BLACK — This control compensates for incoming elevated black levels present in certain video signals, and ensures that blacks in the display are neither crushed (i.e., where dark grays appear black) nor excessively elevated (i.e., where blacks appear dark gray). By default, the projector automatically determines the best setting according to the type of incoming video signal:



- **0 IRE** – Used for DVD output with "enhanced black", SECAM, most PAL standards, and Japanese NTSC.
- **7.5 IRE** – Used for most NTSC video signals.

For some types of video, you can override the setting. The control is disabled for other types of video (and all graphics sources). Generally, if black appears crushed when brightness = 50, choose **0 IRE**. If black appears excessively elevated, use **7.5 IRE**.

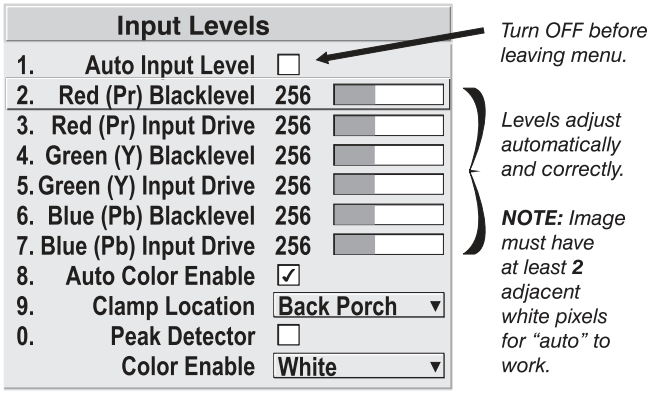
COLOR — This slidebar adjusts the color saturation level, i.e. the *amount* of color in a video image. Lower settings produce less saturated colors — for example a setting of "0" produces a black and white image. If the color level is too high, colors will be overpowering and unrealistic.

TINT — This slidebar adjusts the red/green color hue for true color reproduction of video signals connected to **INPUT 3** or **4**. For best results, adjust tint while displaying an external color bars test pattern—otherwise, use the default setting.

DECODER LUMA DELAY – This control affects any incoming composite or S-video signal, delaying the luma signal (intensity) in relation to the chroma (color). In the image, increasing the luma delay will move luma (seen as a shadow where colors overlap) to the right slightly, with colors remaining in place. Decreasing this delay will move the shadow slightly to the left. If necessary for your current source, adjust so that no shadows occur with adjacent colors.

Input Levels — SUBMENU

*NOTES: **1)** Because the projector automatically optimizes input levels for all but the most unusual of sources, it is recommended that only experienced users use the Input Levels submenu. **2)** Before beginning, check that overall contrast and brightness settings are near 50 and that color temperature is properly set up on an internal grayscale test pattern. **3)** There must be at least two consecutive white pixels present in the image for the "Auto Input Level" function to work properly. **Uncheck** this item before exiting this menu.*


Input Levels
1. Auto Input Level
2. Red (Pr) Blacklevel 256
3. Red (Pr) Input Drive 256
4. Green (Y) Blacklevel 256
5. Green (Y) Input Drive 256
6. Blue (Pb) Blacklevel 256
7. Blue (Pb) Input Drive 256
8. Auto Color Enable
9. Clamp Location Back Porch
0. Peak Detector
Color Enable White
Turn OFF before leaving menu.
Levels adjust automatically and correctly.
NOTE: Image must have at least 2 adjacent white pixels for "auto" to work.

Good RGB or input levels — that is, the drives and *blacklevels* for each of the three colors, red, green and blue — ensure that images from analog sources other than decoded video have maximum contrast without crushing black or white. By default (and in an "Auto Setup"), the projector automatically determines the best input levels by monitoring image content and adjusting the controls appropriately; further adjustment is typically not required to obtain proper blacks or whites.

*NOTE: This automatic adjustment requires at least **two consecutive white pixels** in the image. Without these pixels, input levels may produce skewed colors, particularly in nonvideo images.*

However, for a very unusual source exhibiting one or more overly high blacklevels (typically caused by a noisy source causing blacklevel spikes), an experienced user may prefer to use the *Input Levels* menu (shown above). These adjustments, which together serve as a calibration process compensating for differences in sources and cabling, enable an experienced user to perfect the source image input levels and eliminate the "overshoot" and "undershoot". Note that *Input Levels* are of limited use with digital signals, but do offer some ability to tweak poorly mastered source materials.

AUTO INPUT LEVEL – Keep off for virtually all sources (default). Temporarily enter a checkmark only if you are an experienced user and you have an unusual source that you feel needs further color temperature and/or input level adjustment. After entering a checkmark, wait for the six slidebar values to stabilize, then delete the checkmark and exit. This compensates for incoming out-of-range drives (white) and blacklevels (black) that would cause "crushing" of light and dark colors in the image.

BLACK LEVELS AND DRIVES - To check your image and adjust these controls:

1. Make sure overall "Contrast" and "Brightness" settings are both set to near 50. (Not required for "Auto" adjustment.)

   • Contrast = 50 (approx.)
   • Brightness = 50 (approx.)

2. Check the color temperature setup using an internal grayscale test pattern, making sure to obtain a neutral grayscale. (Not required for "Auto" adjustment.)

3. Confirm that you are using an analog source not connected to **INPUT 3** or **INPUT 4**, as Input Levels are not applicable for digital sources or sources going through the decoder. A grayscale is recommended.

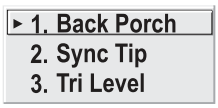
4. If the blacks and/or whites appear OK, input levels do not need adjustment. If black levels are too high (and/or whites are too low, which is rare), you likely have a noisy source that is producing skewed input levels. Continue with Step 5.

5. Temporarily enable "Auto" in the Input Levels submenu. Wait for all 6 values to stabilize. Alternatively, do not use "Auto"—reduce blacklevels manually instead. Judge by eye and change one or more of the six levels as necessary to obtain proper blacks and whites. You may want to see only a certain color while adjusting; if so, use the "Color Enable" option (described below).

6. Delete the "Auto" checkmark and leave the Input Levels menu.

AUTO COLOR ENABLE – When a checkmark is present, selecting a specific blacklevel or drive to adjust will automatically enable the corresponding color in the display. Delete the checkmark to see all colors.

CLAMP LOCATION – This option (formerly known as sync tip clamping) can brighten the image produced from certain high-resolution, high-frequency graphic sources. For almost all sources, the best clamp location is automatically selected by the projector.



Use the normal Back Porch location if the image is either sufficiently bright or overly bright. Select Sync Tip if the image appears unusually dim, if there are horizontal streaks across the image, or if there is significant color drift. This moves the clamping pulse from the normal back porch location (which is likely too short) to the tip of the horizontal sync pulse. Tri Level is typically recommended for an HDTV source where the back porch is also short.

NOTE: Clamp Location is not used for video sources or any RGB source with sync information included on the video (e.g., sync-on-green). Use Tri Level instead.

COLOR ENABLE – Select which color or colors you want to see in the display, useful while working with color temperature white levels or input levels.

NOTES: ***1)*** *Input levels apply for the current source only, but for any color temperature used.* ***2)*** *Assuming that color temperature has been set up based on the internal test patterns, you can then set up input levels for a given source so that it matches the color temperature of the internal test patterns.*

PEAK DETECTOR – The Peak Detector is a fast method for defining individual input levels, and can improve the accuracy of input levels set by the Auto Input level function. Enabling the Peak Detector activates a special operating mode for detecting only pixels that are considered black or white—all other levels are displayed as a mid-level gray. When used with a smooth grayscale pattern in which black and white are known to be at opposite edges of the image, you can watch these isolated areas while adjusting individual blacklevels and input drives until both black and white edges are ***just*** visible and distinguished from neighboring pixels. Images from this source will then display correct blacks and whites without crushing.

See Figure 3.13. ***Adjusting Input Levels Using the Peak Detector:***

1. Display a 16 level grayscale test pattern from the desired external source, and enter a checkmark in the Peak Detector checkbox. *NOTE: The "Peak Detector" will initially render the grayscale as a uniform gray field before adjustment.*

2. Display one primary color (use *Color Enable* to select).

3. For the current color, adjust its corresponding "Blacklevel" slidebar ***just*** until a single band of black appears at one edge of the screen. This band represents the first band of the grayscale pattern, which should be 100% black. Do not adjust too far.

4. With the same color still active, adjust its corresponding "Input Drive" slidebar just until a single band of color appears at the opposite edge of the screen. This band represents the last band of the grayscale pattern, which should be 100% white (or the current color, if a certain color is enabled). Do not adjust too far.

5. Go back and check the black band—adjust the blacklevel slidebar if necessary. Blacklevel and Input Drive adjustments are related, so you may have to go back and forth until both bands are ***just*** optimized.

6. Repeat Steps 2-5 with the other two remaining primary colors. When each primary color shows ***one*** optimized black band and white (or colored) band, the input levels for this source are correctly set. Upon exiting the *Input Levels* menu, the Peak Detector checkbox will clear.

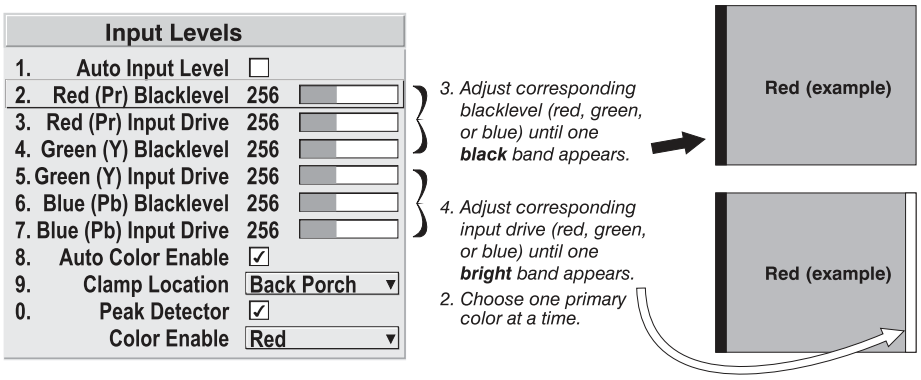
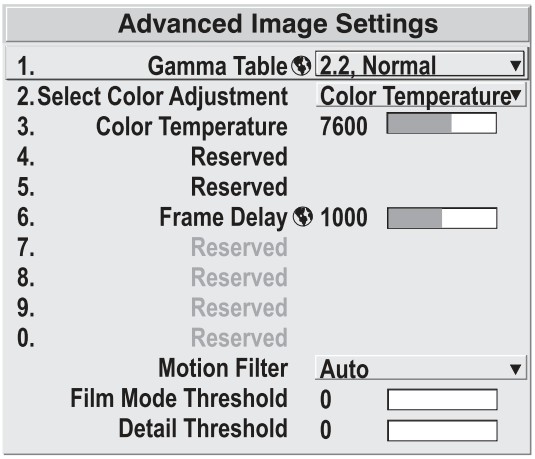

Input Levels
1. Auto Input Level
2. Red (Pr) Blacklevel 256
3. Red (Pr) Input Drive 256
4. Green (Y) Blacklevel 256
5. Green (Y) Input Drive 256
6. Blue (Pb) Blacklevel 256
7. Blue (Pb) Input Drive 256
8. Auto Color Enable
9. Clamp Location Back Porch
0. Peak Detector
Color Enable Red
3. Adjust corresponding blacklevel (red, green, or blue) until one black band appears.
4. Adjust corresponding input drive (red, green, or blue) until one bright band appears.
2. Choose one primary color at a time.
Red (example)
Red (example)

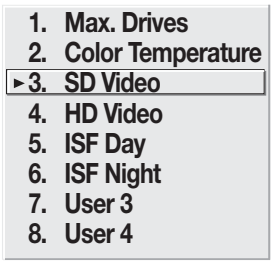
Figure 3.13. Adjusting Input Levels Using the Peak Detector (RED EXAMPLE SHOWN)

Advanced Image Settings — SUBMENU



GAMMA TABLE: This control selects and applies the normal 2.2 gamma setting or a user-defined "arbitrary" (custom) gamma table that has been previously downloaded to projector memory (these custom gamma tables—a.k.a. *curves*—are created in *Runco's Arbitrary Gamma* application for the PC, and are downloaded via a separate utility). Use of custom curves can improve performance for certain kinds of source input and applications. Generally the best gamma curve is one that produces maximum contrast, brightness and color performance for the current signal and ambient lighting conditions.

NOTE: If no such curves have been defined and downloaded to projector memory, only the "2.2, Normal" default gamma curve is available here—adjust as desired in the main ***Image Settings*** *menu.*



SELECT COLOR ADJUSTMENT: In "Select Color Adjustment", choose an overall color performance for all images. The "Max Drives" factory default simply drives all 3 colors at their maximum level so that they are fully on and cannot be changed. The two other pre-defined color adjustment choices—*SD Video and HD Video*—apply a color gamut optimized for video sources (standard or high-definition). Alternatively, you can specify a color temperature, which enables the nearby Color Temperature slidebar and applies its current setting (default = 6500K). If none of the pre-defined "Select Color Adjustment" options or color temperatures suit your application, select one of four color gamuts previously defined by a user (ISF Day, ISF Night, 3, 4). A "User" option applies a customized color performance in which the user has precisely set the hue and intensity of each color component in the *Color Adjustment by X/Y* or *Color Saturation* submenus, and is most often needed with multiple-projector applications. Select the color adjustment producing the best color accuracy for your application and installation.

To configure a “User” color adjustment (gamut), use either the *Color Adjustment* by *X/Y* or *Color Saturation* submenu found in the Configuration menu under *Geometry and Color*.

NOTES: ***1)*** *“Color Temperature” defaults to 6500K until changed. Both “User” options default to SD Video unless they have been redefined by the user.* ***2)*** *Factory defined color primaries, which ensure consistent color gamut from projector-to-projector, can be altered in the Service menu only. If you suspect alteration, the factory settings can be recovered with selection of Factory Defaults in the Service menu (password-protected).*

COLOR TEMPERATURE — Adjust to apply a specific and accurate color temperature to all displays. Color temperatures are expressed in kelvins (3200-9300K), and utilize different combinations of the projector’s original native color primaries to produce a “coloration” or cast (reddish or bluish) in images—the lower the temperature, the more reddish the cast; the higher the temperature, the more bluish the cast. Note that the slidebar is enabled only if you have a source connected and have selected “Color Temperature” in the adjacent “Select Color Adjustment” pull-down list in the *Advanced Image Settings* menu.

FRAME DELAY — Set the interval of delay desired between the input signal and its appearance on screen. For applications such as simulation, where the feeling of “real time” image response is a priority, a minimum setting is usually preferable. For projectors capable of 3D (stereographic) applications where alternating left-right frames must be synchronized with the corresponding L/R shutters in 3D glasses, a frame delay setting of two (or multiple of two) may be more useful. Delay may vary between sources.

MOTION FILTER — This control is most useful for smoothing out moving images from interlaced sources. In most cases the proper Motion Filter setting is automatically determined according to the type of incoming source signal. However, if your source is jittery and/or tearing you may wish to “force” a setting to ensure stable processing for this source—if desired, override the default “Auto” setting by selecting the appropriate motion filter:

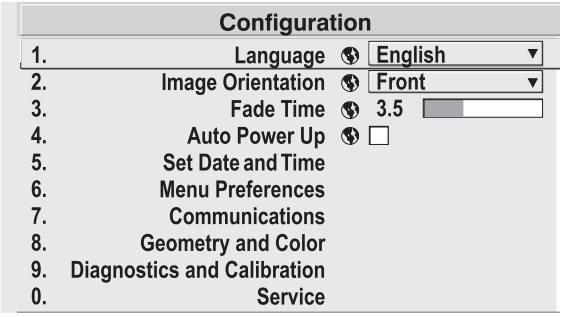
1. **AUTO:** The projector will automatically use the correct motion filter according to the incoming signal.
2. **STILL:** For static images with no motion, such as graphics from a CD.
3. **MOTION:** For video images that did not originate from film, or for moving computer-generated images.
4. **FILM:** For video images that originated from film. This will optimize image quality and stability.

FILM MODE THRESHOLD — This setting determines how sensitively the projector can detect if an incoming video signal originated from film or not.

DETAIL THRESHOLD — Use “Detail Threshold” to define at what frequency level the “Detail” control will begin to magnify high frequencies, which adds details back into the image. Raise the threshold to *ignore* more of these high frequencies, and lower the threshold to *magnify* more of these frequencies. A setting of “0”, for example, means no noise will be ignored and all will be magnified. An ideal detail threshold is one in which high frequencies that are causing objectionable noise are *not* magnified when using “Detail”, but frequencies which can help sharpen an overly-soft image *are* magnified when using “Detail”.

3.6 Adjusting System Parameters and Advanced Controls

Use the *Configuration* menu to define general operating parameters and communications with other projectors and equipment, and to access other advanced processing and image adjustments affecting overall performance. In addition, the *Configuration* menu provides access to diagnostic and calibration tools, as well as the *Service* submenu (password protected).



Keep in mind that settings in the *Configuration* menu (and its submenus) are typically "global" settings applied regardless of the type of source your are using. This characteristic is identified with the (globe) icon alongside the option. *NOTE: The* Configuration *menu is recommended for experienced users/technicians only.*

The first six options in the *Configuration* menu are explained below:

◄ ***System Configuration — GENERAL —***

Language
Choose from available languages to use in the projector's menus. The change will take effect immediately.

Image Orientation
Set the orientation of the image according to the orientation of your projector. If the setting is incorrect, projected images will be reversed and/or upside down.

Fade Time
Set how long (in seconds) it takes to gradually dissolve one image into another for a source switch.

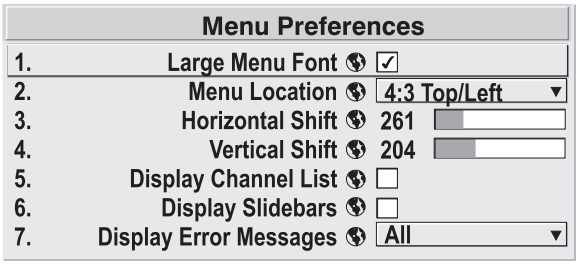
Auto Power-up
Enter a checkmark to enable the projector to automatically power up after losing power due to a power failure or due to unplugging the projector during operation. Runco recommends that this be left unchecked, as a power loss in an unattended house will result in the projector turning on without anyone realizing it is on.

Note that unsaved display adjustments may be lost.

Set Date and Time
Enter/read the current year-month-day and hour-minute-second. Changes here reset the projector's real-time clock.

Menu Preferences — SUBMENU

Use the options in this submenu to adjust the appearance, content and/or location of on-screen menus and messages.



LARGE MENU FONT — Enter a checkmark to enlarge menus and their text. You may have to adjust "Menu Location" to accommodate the increased menu area.

MENU LOCATION — Use the pull-down list to choose a pre-defined default or customized location for the display of all on-screen menus.

To create a custom menu location quickly, choose a preset that is closest to the desired location. Then adjust *"Horizontal Shift"* and *"Vertical Shift"* slidebars to move the menu to the desired location. Avoid locations too close to a corner or edge to prevent cropping of larger menus.

HORIZONTAL SHIFT AND VERTICAL SHIFT — Shift your menus as desired, creating a customized menu location.

DISPLAY CHANNEL LIST — Enter a checkmark if you want to see a scrollable channel list whenever you press Channel (**CHANL**) from your presentation. Channels marked with a list icon in the *Channel Setup* menu will appear here. The "Display Channel List" option also enables on-screen feedback when using the Input key. If you prefer to hide the channel list and input dialog box while switching channels and sources during a presentation, clear the checkbox.

NOTE: The Channel List and input dialog box cannot be hidden during use of the menus.

DISPLAY SLIDEBARS — This setting is not applicable to this projector/remote combination.

DISPLAY ERROR MESSAGES — Choose in what way you want to be notified of errors detected in either the incoming signal or projector. Select "Screen" or "All" to see a brief on-screen message or select "RS232" to receive messages via RS232 (or RS422) serial communication only. Select "Off" to hide error message displays. Because the DHD Controller uses the RS232 port, Runco recommends this be set to **Screen**.

Settings in the Communications submenu define and control how single or multiple projectors are can link with each other and with a controlling device.

◄ ***System Configuration***
— COMMUNICATIONS —

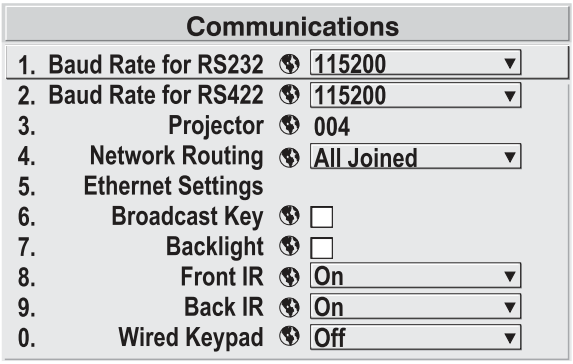


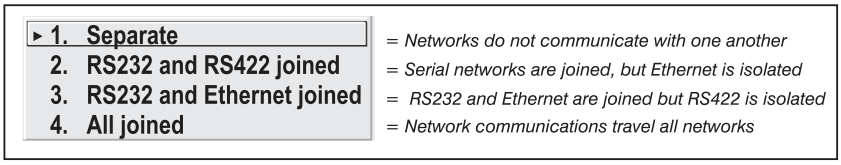
Figure 3.14. Communications

Baud Rates
The baud rate setting determines the speed of communication to and from the projector on the RS232 or RS422 links. The maximum rate for either standard is 115200. The default baud rate for use with the DHD Controller is 115200. If this is changed, communication with the DHD Controller will be lost.

Projector
Enter a three-digit number (such as “001”) to assign or change a number to the projector currently in use. If the current projector already has a number assigned, that number will appear here (for example, “004” in Figure 3.14, above). Numerical identity for projectors enables you to communicate with a single projector within a multiple-projector application. If you make a mistake in assigning or changing the projector number, press **Exit** to cancel.

NOTE: This feature is not used when the projector is used with the DHD Controller.

Network Routing
NOTE: This feature is not applicable when the projector is used by itself, with the DHD Controller or in a simple serial network with only one type of controller and linking.


▸ 1. Separate = Networks do not communicate with one another
2. RS232 and RS422 joined = Serial networks are joined, but Ethernet is isolated
3. RS232 and Ethernet joined = RS232 and Ethernet are joined but RS422 is isolated
4. All joined = Network communications travel all networks

SEPARATE: Select “Separate” (factory default) to keep RS232, RS422 and Ethernet messages on their respective paths instead of being broadcast to the other types of ports.

Ethernet Settings (SUBMENU)
This menu is reserved for future use.

Backlight
Toggle the built-in keypad lighting on/off.

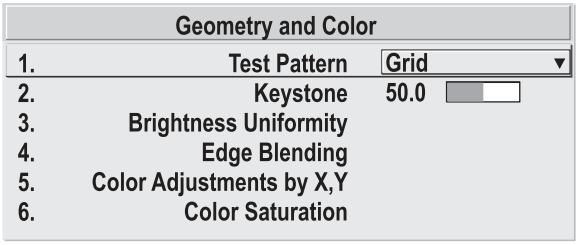
Front IR / Back IR
As needed for your application, set to “on” so that the front and/or rear IR sensor locations on the projector responds to the IR keypad. Set to “off” to disable.

To disable *both* IR sensors, you cannot use the IR remote keypad to select the second OFF setting. This safeguard prevents accidentally disabling an IR keypad while you are using it. Instead, use either the built-in keypad or a wired remote (optional) to set the remaining active sensor to OFF. The projector will no longer respond to an IR remote keypad.

Wired Keypad
Select “On” to enable use of a wired remote keypad connected to the rear of the projector. The projector will then respond to incoming commands from either port. To disable the wired keypad, you must use a different keypad—the built-in or an IR remote keypad—to select “off”. This safeguard prevents you from accidentally disabling the wired keypad during use.

➤ ***Geometry And Color***

In the *Configuration* menu, select the *Geometry and Color* submenu when you need to modify overall color performance and/or image geometry for all sources.



Test Pattern
Choose the desired internal test pattern or select OFF to turn off a test pattern. Alternatively, use the **TESTP** key for cycling through test patterns.

Vertical Keystone
Use to correct a keystoned image shape in which both sides of your image are inclined toward the top or bottom edge. Keystone is typically caused by tilting the projector in relation to the screen, so that the lens surface and screen are no longer parallel to each other.

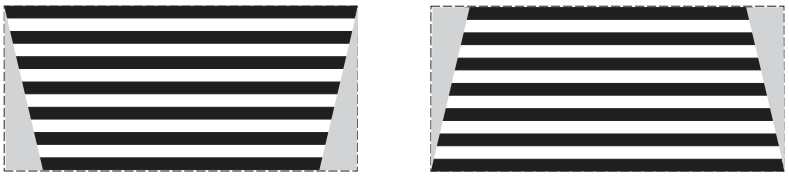


Figure 3.15. Keystone Adjustment

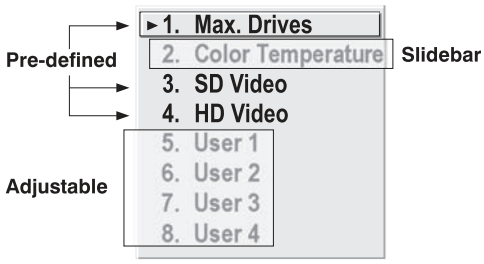
NOTE: Runco recommends that the keystone feature not be used unless absolutely necessary, as it may cause some artifacting in the image.

Brightness Uniformity — SUBMENU
Brightness Uniformity provides further refinement of displays already matched for their primary colors and overall light output. Use Brightness Uniformity to create an exceptionally smooth image in which no area appears brighter and/or more red, green or blue than another. In the *Brightness Uniformity* menu, check the “Uniformity Enable” checkbox to access a multitude of adjustments for critical color light output control in specific areas throughout the image. Your settings apply as long as the “Uniformity Enable” checkbox is enabled and you are using a “User” color temperature defined by the Brightness Uniformity controls. Remove the checkmark from the “Uniformity Enable” checkbox to disable the Brightness Uniformity function.

Edge Blending — SUBMENU
The Edge Blending submenu provides a range of controls for smoothing together the overlapping bright edges of multiple adjacent projected images to create a single larger "seamless" image.

Color Adjustments by X/Y, and Color Saturation — SUBMENUS
NOTES: ***1)*** *For defining or changing a User 1, 2, 3, or 4 color performance or "gamut". Sometimes known as Comprehensive Color Adjustment™.* ***2)*** *Factory-measured primary color levels, which ensure a specific color performance from projector-to-projector, can be altered in the* Service *menu only. If you suspect alteration of these defaults, the factory settings can be recovered with selection of "* Factory Defaults*" in the* Color Primary Settings *submenu accessed via the* Service *menu (password-protected).*

From the factory, the projector can utilize any of the three pre-defined color performance settings identified at right (default=Max Drives) or colors can be driven on the basis of color temperature. For most applications, one of these options will produce accurate and realistic colors from a variety of sources. They can be applied at any time in the *Advanced Image Settings* menu ("Select Color Adjustment") and are not adjustable.



DEFINING "USER" COLOR GAMUTS: In some cases, you may find that none of the predefined "Select Color Adjustment" options exactly suit your needs. For example, you may require a unique color gamut (range) for a single projector or application, or you may need to precisely match colors across multiple adjacent displays. In such cases, use either the *Color Adjustments by X,Y* or *Color Saturation* submenu to define the precise *hue* of each primary color component (red, green, blue, and white) used to generate the millions of colors produced in displays. You can create up to four custom color gamuts (User 1, 2, 3, or 4) defined by these adjustments.

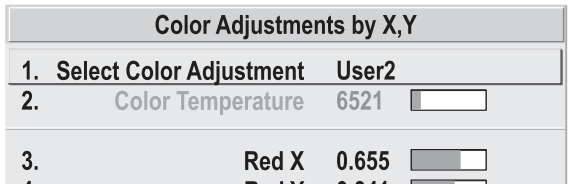
Note that the two menus differ only in their user interface, so use whichever menu best suits your needs and application.

- ***Color Adjustments by X,Y —*** Enter known x/y coordinates from the chromaticity graph. For best results, use with a color meter.
- ***Color Saturation —*** Adjust color slidebars and judge image color by eye. A color meter can also be used.

A user-defined color "adjustment" can be applied by selecting it in the Advanced Image Settings menu ("Select Color Adjustment").

NOTE: Defining a "User" color gamut when a test pattern is displayed does not get saved in the current channel. Display the source first, then select a color gamut (User) from Select Color Adjustment. Changes here are then saved for that source in channel memory.

COLOR ADJUSTMENT BY X,Y: Use this submenu if you want to alter, add or copy a color gamut (i.e., “color adjustment”). Controls in this menu define the precise hue of each primary color component (red, green, blue, and white) used to generate the millions of colors produced in displays. The x/y coordinates for each color define its location on the standard CIE chromaticity graph (see Figure 3.16)—changing either or both of these numbers will change the hue of the color, and relocate the “triangle” for possible colors. For example, changing the x/y coordinates for red will either move the color closer to orange or closer to violet, which will in turn affect all displayed colors having a red component. Adjust the slidebars or enter new specific coordinates as desired to define or change up to four “User” color gamuts needed for your environment and applications. Apply the new “User” color gamuts at any time in the *Advanced Image Settings* menu.


Color Adjustments by X,Y
1. Select Color Adjustment User2
2. Color Temperature 6521
3. Red X 0.655
4. Red Y 0.341
5. Green X 0.332
6. Green Y 0.575
7. Blue X 0.144
8. Blue Y 0.093
9. White X 0.320
0. White Y 0.330
Auto Color Enable

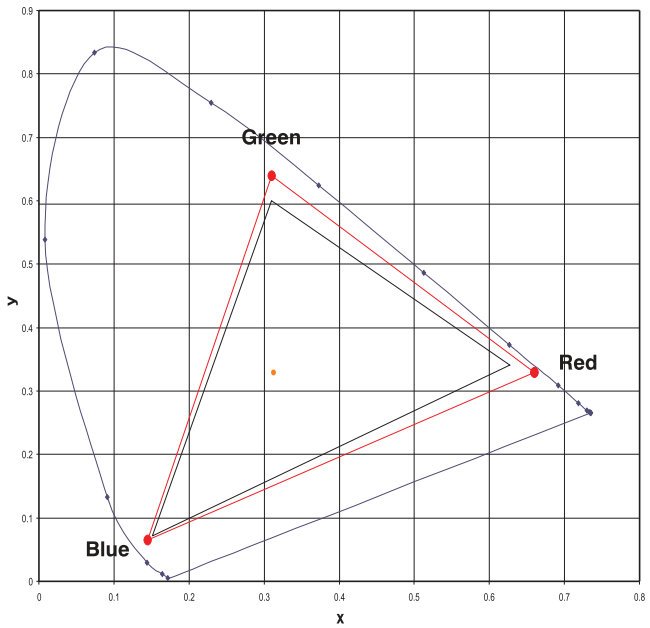


Figure 3.16. CIE 1931 Chromaticity Diagram

NOTE: Keep new x,y coordinates within the original color gamut triangle shown here. Refer to Section 6, Specifications, for color primaries.

COLOR SATURATION: Use this submenu if you do not have specific color coordinates in mind and will simply judge color performance by eye (or meter). Like the *Color Adjustment by X,Y* submenu, each color control actually defines new x/y coordinates for that color and changes its hue — it is just a different interface.

Adjust the hue of each primary color (red, green, blue, and white) by using more or less of it in relation to the other colors.

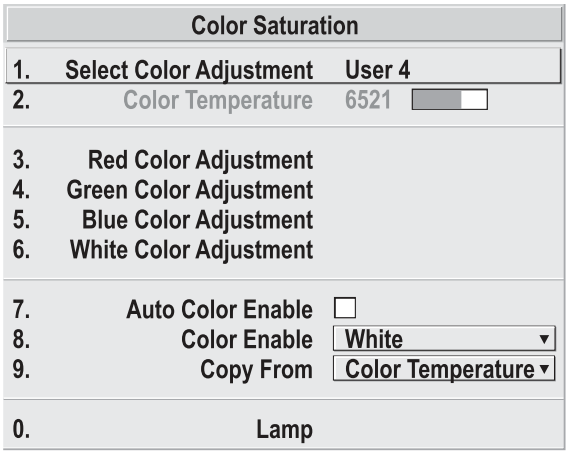


Figure 3.17. Customize Color

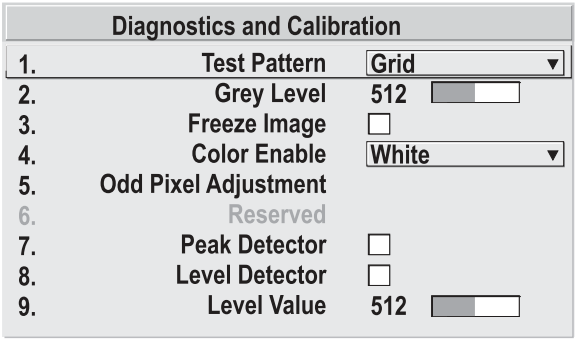
NOTE: A Color Saturation *adjustment sets the corresponding x/y coordinates shown in the* Color Adjustment by X,Y *submenu. These x/y coordinates will remain stable for this User gamut until they are changed again via either menu. Values displayed in the* Color Saturation *menu, however, will likely fluctuate as you use the projector, and will be different when you return to this menu at some point in the future. These floating changes do not affect the x/y coordinates or gamut.*

Diagnostics and Calibration ➤

Test Pattern

Choose the desired internal test pattern to display or select OFF to turn off a test pattern. Alternatively, use the **TESTP** button on the remote control for cycling through test patterns.

NOTE: Runco recommends that all calibration parameters (grey scale, sizing, etc.) be done with external test patterns.



Test Pattern Grey Level

Set the desired level of grey for displaying in the full gray field test pattern.

Freeze Image

Enter a check mark to freeze (stop) an image on a single frame. This diagnostic tool is useful if you need to examine in detail a still version of an incoming image that cannot be “frozen” at the source. For example, in moving images it is sometimes difficult to observe artifacts such as external deinterlacing/resizing and signal noise. Remove the checkmark to return back to normal.

Color Enable
Select which color or colors you want to see. This is useful while working with color temperature, input levels or other special setup parameters.

Odd Pixel Adjustment
NOTES: Factory-set and rarely required by user.

When using certain RGB sources, you may need to adjust the normal gain or offset of odd pixels in relation to even pixels. This will smooth out very narrow (1-pixel wide) "checks" or vertical stripes that indicate adjacent "on" and "off" pixels. Although offset and gain slidebars can be adjusted individually and manually, using the Level Detector simplifies this process (see Figure 3.21):

1. Use an external analog native-sized continuous grayscale test pattern with at least 256-levels.
2. Turn "Level Detector" on.
3. Set "Level Value" to ***~200***. The image should now be black-and-white (or black-and-one color, if you use "Color Enable" function).
4. Adjust ***offset***. Half of the pixels will move, the other half will not.
5. Adjust until the two transition regions overlap. The stripe of noise will be minimized, defined by the value in the slidebar.
6. Set "Level Value" to ***~800***. The image should now be black-and-white.
7. Repeat Steps 4 and 5, but adjusting ***gain***.
8. Repeat Steps 3-7 for all remaining colors. Your RGB source should now be OK.

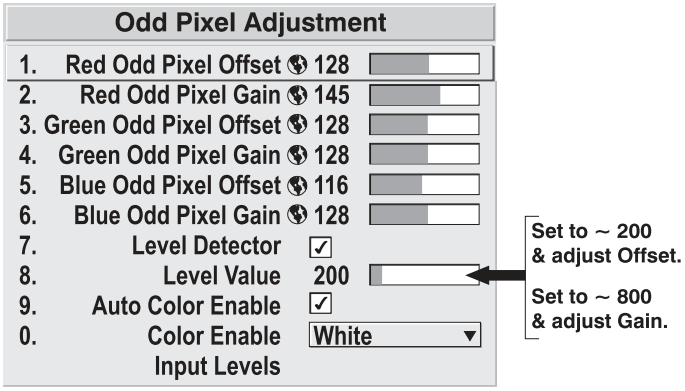

Odd Pixel Adjustment
1. Red Odd Pixel Offset 128
2. Red Odd Pixel Gain 145
3. Green Odd Pixel Offset 128
4. Green Odd Pixel Gain 128
5. Blue Odd Pixel Offset 116
6. Blue Odd Pixel Gain 128
7. Level Detector
8. Level Value 200
9. Auto Color Enable
0. Color Enable White
Input Levels
Set to ~ 200
& adjust Offset.
Set to ~ 800
& adjust Gain.

Figure 3.18. Using Odd Pixel Adjustment

*NOTES: **1)** Adjust offset before gain, since offset affects gain. **2)** A value of 128 represents no change in normal odd pixel offset or gain. **3)** Odd Pixel Adjustment eliminates "1 pixel on, 1 pixel off" patterns only, not any type of larger patterns.*

Reserved
No function.

Peak Detector
The "Peak Detector" is fast method of defining individual input levels, and can improve the accuracy of input levels set by the Auto Input Level function. Enabling the "Peak Detector" activates a special operating mode for detecting ***only*** pixels that are considered black or white — all other levels are displayed as a mid-level gray. When used with a 16-step grayscale pattern in which the two black and white bands are known to be at opposite edges of the image, you can watch these isolated areas while adjusting individual blacklevels and input drives until both bands are just visible. Images from this source will then display correct blacks and whites without crushing or washing out.

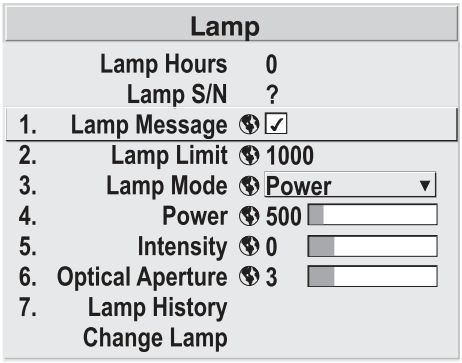
Level Detector
The "Level Detector" checkbox enables specific thresholds for blacks and whites — input levels that fall below a specified *Level Value* (see below) are displayed as black, and all others are displayed as white. It aids in Odd Pixel Adjustment. To use:

1. Enable "Level Detector" and display a continuous grayscale.
2. Set "*Level Value*" to near black (such as 200).
3. Adjust Offsets to minimize area of black stripe.
4. Set "*Level Value*" to near white (such as 800).
5. Adjust Gains to minimize area of white stripe.

Level Value
The "*Level Value*" defines the value to be used by the *Level Detector* in recognizing blacks and whites. Refer to *Level Detector*, above.

3.7 Working with the Lamp

Whenever you install a new lamp in the projector, access the *Lamp* menu to record the lamp serial number in the projector's memory. You can also choose a lamp mode for regulating power and light output, change optical aperture size, and access other read-only information pertaining to past and present lamps.



LAMP HOURS shows the number of hours logged on the current lamp. Whenever you record a new lamp serial number this value automatically resets to "0", where it begins to log time for the new lamp.
NOTE: Read-only. This information also appears in the Status menu.

LAMP S/N is the serial number recorded for the current lamp. When you install a new lamp and enter its serial number, the number will appear here. *NOTE: Read-only.*

Enter a checkmark for **LAMP MESSAGE** to enable a warning message that will appear upon power-up when the lamp has reached the specified lamp limit and should be replaced. Delete the checkmark to prevent display of this message—instead, when your lamp expires, only the status display messages on the back of the projector will provide the visual warning to replace the lamp.

*NOTES: **1)** It is recommended that the Lamp Message checkbox remain enabled. **2)** When a lamp warning message appears, press **Exit** to temporarily cancel the message. The message will continue to appear upon power-up until you install a new lamp.*

Set **LAMP LIMIT** to the number of hours you expect to log on the current lamp before replacing it. This will trigger a lamp message on-screen (if enabled).

*NOTES: **1)** If you change modes over the life of a lamp, the lamp limit you originally expected may no longer be possible. **2)** Turning the lamp on and off reduces lamp life significantly, as do other factors. **3)** It is recommended that Lamp Limit not exceed the expected lamp life, otherwise a lamp could become dangerously fragile with overuse.*

Set which **LAMP MODE** you want to use in order to control the light output. You can choose to run the lamp as bright as possible (i.e., always using maximum power—this is the default upon power up) or you can power the lamp with a specific wattage appropriate for the installed lamp or you can set a specific intensity (brightness) to maintain. Although there are exceptions, generally higher light output or higher power settings can shorten lamp life.

Figure 3.19. Lamp Mode

Use the lamp mode that best suits your brightness needs. For example, in a tiled application you may want to precisely match brightness levels between adjacent images—judge by eye and set each individual **Lamp Power** setting as necessary. Or if you want images to be as bright as possible—choose **Max Brightness**. Always keep in mind that higher lamp power settings can shorten lamp life.

Lamp modes are described below:

- **Max Brightness:** The lamp will always burn as brightly as possible, driven by 100% of the power level rating for the installed lamp *(see Section 6, Specifications)*. Keep in mind that the "maximum brightness" for any lamp gradually diminishes with age — images will become dimmer over time. Its current output level appears in the **"Intensity"** option (note: *not* in lumens).
- **Intensity:** Brightness will remain close to a specified level for as long as possible. Once you select this option, enter a number representing the intensity level (brightness) you wish to maintain—the projector will automatically adjust power as needed to maintain this intensity as closely as possible. Note that the intensity value is a correlation only and does not represent an actual lumens level. See **"Intensity"** on the next page.
- **Power:** The power supplied to the lamp will remain at your specified wattage level. Once you select this option, enter the number of watts representing the power level you wish to maintain. See **"Power"** on the next page.

POWER – This slidebar and number indicates how many watts are applied to the lamp. You can apply anywhere from approximately 60-65% of the maximum power intended for the installed lamp up to 100% of the lamp rating. Set for the number of watts as desired, keeping in mind that lower power levels produce dimmer images. When in either **Power** or **Max Brightness** modes, the power level remains constant. Specifying a maximum power level here is the same as operating in **Max Brightness** mode.

*NOTES: Power level can be set only if the lamp is in **Power** mode.*

INTENSITY – This value and slidebar represents the current brightness of your lamp, decreasing over time when you are operating in Max Brightness mode or at a specific Power level. When you are operating in "Intensity" mode this value remains at the original "Intensity" setting chosen and cannot be adjusted.

NOTE: The number shown for "intensity" is not the actual lumen output, but rather a correlated value only—1246 may represent 3500 lumens, for example.

To use **"Intensity"** mode, judge by eye (or use a meter) and set the level as desired for your application. Over time, the projector will automatically increase the power supplied to the lamp as needed to maintain the chosen intensity as closely as possible.

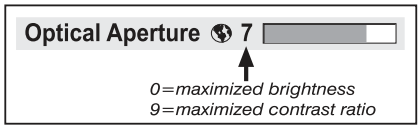
HOW LONG CAN I MAINTAIN BRIGHTNESS? Software can maintain your **"Intensity"** setting until the required power reaches the maximum rating for the lamp. The lower the setting, the longer it will take to reach this threshold and the longer you can maintain the desired brightness. Keep in mind that once the lamp power reaches its maximum wattage (see **"Power"**, above), this tracking is no longer possible. At this point, the lamp will gradually begin to dim as usual, even though your original **"Intensity"** value will still appear in the menu. To resume accurate tracking, reduce the intensity setting so that the resulting **"Power"** value is less than its maximum—the lower the intensity, the longer it can be maintained.

For example, a 1000 watt lamp can be driven at no more than 1000 watts. To produce desired brightness at the screen, a new lamp would likely need less than this maximum rating — perhaps 812 watts (example only). Over time, however, the lamp will require more and more current in order to generate the desired light, until eventually the lamp wattage reaches its 1000-watt maximum and the lamp power automatically levels off. At this point, the tracking function terminates (i.e., the power level stabilizes) and the lamp will begin to dim normally. Either reduce your **"Intensity"** setting or replace the lamp.

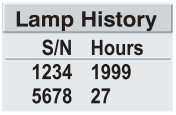
Do not lower the **"Intensity"** so much that the corresponding **"Power"** value reaches its *minimum*—the intensity setting will be inaccurate and cannot be maintained. For best results in achieving uniform intensity amongst tiled images, choose an **"Intensity"** setting that enables all lamps to operate at less than the maximum number of watts available in your projector but high enough to keep the corresponding lamp power above its minimum. See **"Power"**, above.

*NOTES: **1)** Lamps become more stable over time, thus a specific intensity is more easily maintained as the lamp ages. **2)** Intensity can be set only if the lamp is in "Intensity" mode **3)** Intensity cannot exceed the output of Max Brightness mode.*

OPTICAL APERTURE – The optical aperture inside the projector controls the diameter of the light beam passing through the system. With a fully open aperture (slidebar default of "0"), the maximum amount of light passes through for maximum brightness in your images. Increase the slidebar setting to reduce the aperture diameter and maximize contrast ratio instead.



LAMP HISTORY – This read-only option lists the lamps most recently installed and recorded in the projector. *Lamp History* automatically updates whenever you record a new lamp serial number—the new lamp is added to the bottom of the list.



Use **CHANGE LAMP** to record the serial number for a newly installed lamp:

In the *Lamp S/N* window, use the number text entry keys to record the new lamp serial number and press **Enter** again to accept the change. See *Using Slidebars and Other Controls* if you need help entering the number. Once entered, the new lamp serial number will be added to the *Lamp History* menu and the *Lamp Hours* timer will reset to "0". *Lamp Mode* and Lamp Limit remain as they were for the previous lamp and can be changed at any time.

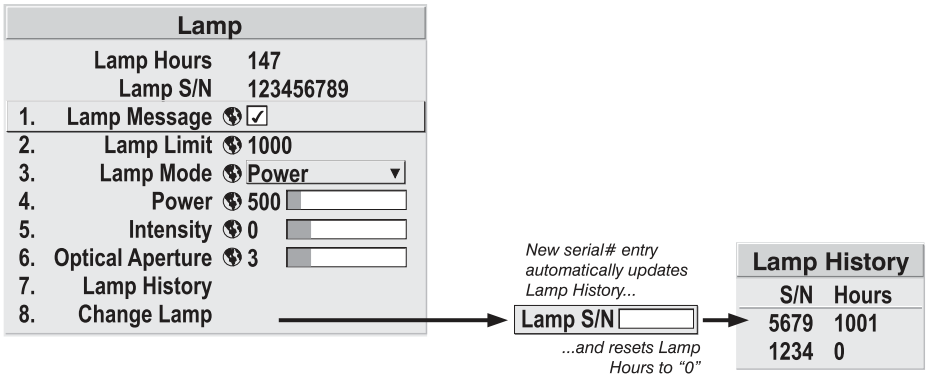


Figure 3.20. Recording the New Lamp Serial Number

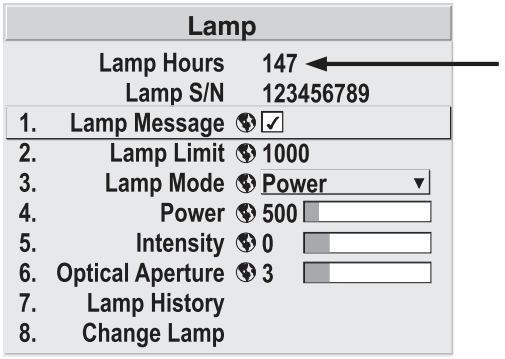
*NOTE: Enter a serial number **only** if you have just installed a new lamp. This will help ensure that lamp timer is not reset on an old lamp and that the number of hours logged on the lamp will be accurate.*

IMPORTANT
Always record the serial number of a NEW lamp.

How Old is My Lamp? ➤

When a new lamp is installed and its serial number recorded by selecting "Change Lamp" in the *Lamp* menu, the lamp timer resets to "0" and begins logging time for the new lamp. This tally appears in both the *Lamp* menu (see right) and the *Status* menu.

To review the number of hours logged for previous lamps, consult the *Lamp History* menu.



When to Replace the Lamp ➤

If the "Lamp Message" checkbox has been enabled in the *Lamp* menu (recommended), an expiry message will appear upon power-up when the lamp has reached its defined "Lamp Limit". The lamp should be replaced.

The "Lamp Limit" setting should not exceed the expected lamp life, as an old lamp becomes increasingly fragile and more prone to sudden failure. See also ***4.4, Lamp Replacement.***

3.8 Status Menu

The read-only *Status* menu lists a variety of details about the standard and optional components currently detected in the projector. Refer to the *Status* menu for versions of hardware and software installed, the type (size) of lamp, the hours logged in total and for a specific period (such as a rental period), and for your projector model name and serial number. In addition, the *Status* menu identifies the current channel, its location, its frequencies and other details.

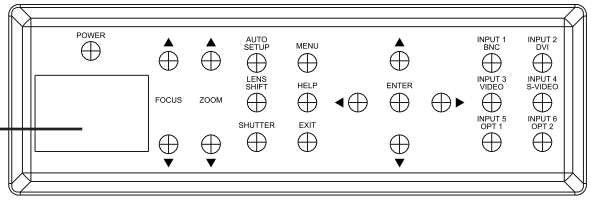
Scroll the full *Status* menu using ▲ and ▼ on the directional keypad. Use ◄ and ► for page up/down.

3.9 Error Conditions

Occasionally the projector will encounter an error condition that can interrupt normal operation. Such a condition can be caused by a simple invalid keypad entry, an input signal error (most common) or a system error. The manner in which users are to be notified of error conditions is set in the *Menu Preferences* menu:

- To see error messages displayed on-screen, select the "**Screen**" or "**All**" option. (recommended by Runco)
- To be notified via a serial communication only, select the "**RS232**" option.
- To receive both types of notifications, select "**All**".
- To disable error messages (except for "invalid user key entry", which can't be hidden), select "**Off**".

Note that a two-digit error code appears in the status LED display window located beside the built-in keypad at the rear of the projector. Normal operation is indicated by the "On"status code.



LED status display window

Invalid User Entry

◄ ***User Errors***

A keypad entry not recognized by the projector triggers a short on-screen error message identifying the problem. For example, if you specify a channel number that is not available, the message *"Invalid Channel"* will appear. Or if you try to enter the wrong password, you'll see *"Invalid Password"*. Press **Enter** or **Exit** to clear the message and try again.

NOTE: On-screen display of "Invalid User Entry" messages cannot be disabled, even if ***Display Error Messages*** *has been set to "Off".*

◄ ***Input Signal Errors***

An input signal error message occurs if you are in presentation level (i.e., there are no menus present) and have selected an input on which the projector detects a problem.

While menus remain operational and any key press will temporarily remove any displayed error message, you must resolve the signal problem in order to permanently eliminate the message.

No Signal

The message *"No signal"* occurs when there is no source signal detected at the selected input—both HSYNC and VSYNC are inactive and the screen background is black. Connect or correct the signal, or try another input.

Bad Sync

The message *"Bad Sync"* occurs when HSYNC or VSYNC are active but the signal cannot be displayed. Such a condition occurs when only one of the two sync signals is present or when either sync signal is unstable or of the wrong frequency. Correct the signal or select another input.

Other Signal Error Messages

In addition to the common *"Bad Sync"* and *"No Signal"* errors, you may encounter a signal error message indicating that HSYNC and/or VSYNC are either too fast or too slow. When such a message appears, check the frequencies shown in the Status menu. If they are correct, then the signal is not recognized by the projector. On some PCs you may be able to change the settings to generate a compatible signal. If the frequencies shown in the Status menu are incorrect, check the cabling to see where the problem might originate.

When the projector encounters a system malfunction, either a System Warning message or a System Error message may appear. Both types of messages are accompanied by a numerical error code on the status LED display. A system malfunction can be cleared with Exit from presentation level, but may indicate the need for service by a qualified service technician.

NOTE: System messages appear on-screen only if Display Error Messages *has been set to "Screen" or "All".*

System Warnings

A system warning indicates that a system malfunction has been detected (see *Status LED Codes*, below). A system warning message replaces any input signal message and disappears when the input signal status changes. While the projector will remain operational, the message indicates the presence of a potentially serious problem that should be investigated. You can press **Exit** to remove the message, but for best results you should reset the projector—power the projector down and up again with the (power) key.

System Errors

A system *error* message indicates that a serious malfunction has been detected and must be investigated as soon as possible (see *Status LED Codes*, below). The projector will no longer operate and must be reset—power the projector down and up again with the (power) key.

The Status LED Codes

If the status code display on the back of the projector shows one of the following values, you have encountered a likely system error requiring the attention of a qualified service technician (see *System Warnings* and *System Errors*, above). Acknowledge and clear the error with Exit from presentation level, or try resetting the projector by powering it off and on again, cooling when necessary. Refer to Table 3.3 and contact your dealer if the problem persists.

The specific code number identifies the source of the error detected, and is particularly useful in cases where the projector is far away. For example, the code "27" means the lamp could not be turned on. Table 3.3 lists the error codes for this projector.

Table 3.3 Error Codes

Code	Description
GENERAL	
12	Software bug. Contact dealer/factory.
13	CRC error in flash ROM. Download new software.
14	Engineering-only programming is complete. Call Runco, replace TIPM.
15	Attempting to download code without being in boot mode
16	Invalid interrupt. Power off/on. If it persists, contact dealer/factory.
17	User forced system to stay in boot mode
18	Jumper for programming boot not installed
LAMP FAILURES	
20	Lamp turned on unexpectedly (fault related to ballast)
21	Lamp airflow low, overheating imminent
23	Cannot read valid ballast ID
26	Lamp 1 Interlock: lamp door open, lamp not installed
27	Can't turn lamp on
28	Lamp turned off unexpectedly
29	Lamp ballast overheated
POWER AND COOLING	
46	Red DMD temperature probe overheated
4C	Projector shutdown due to critical error
C0	Lamp blower failure (lamp not turned on)
51	LVPS fan failed (Fan 1)
52	LVPS/ Red cooling fan failed (Fan 2)
53	DC lamp fan failed in 500W / 1kW models (Fan 3)
54	Red DMD heatsink fan failed on 1kW and 1.2kW models (Fan 4)
55	Green DMD heatsink fan failed on 1kW and 1.2kW models (Fan 5)
56	Blue DMD heatsink fan failed on 1kW and 1.2kW models (Fan 6)
57	TIPM fan failed (Fan 7)
58	TIPM fan failed (Fan 8)
TIPM (Image Processor)	
60	Boot code CRC failed
61	Unable to program DigMux PLD
62	Unable to program Control PLD
63	Unable to program Bubks PLD
64	Unrecognized ROM type
65	Write to flash ROM failed
66	TIPM failure
67	Downloaded code will not fit
68	Scaler communication problem
BUILT-IN KEYPAD	
70	Unable to access EEPROM on the built-in keypad
71	EEPROM memory re-initialization on the built-in keypad
PANEL DRIVER AND FORMATTER	
80	Unrecognized Panel Driver
81	Unable to program device on Panel Driver
82	TI flash download failure
83	TI flash download failure
84	TI flash download failure
85	TI-I2C write failure
86	One or more Formatters not responding — Probable Formatter s/w fault
87	Formatter reports RDRAM failure
88	Red modular Formatter communication failure
89	Green modular Formatter communication failure
8A	Blue modular Formatter communication failure
93	Modular formatter architecture error
94	Modular formatter DMD mismatch
95	Modular formatter sequence mismatch
MISCELLANEOUS	
A0	Unable to program the optional module
A1	Unable to power the optional module
A2	Unable to program the Dual Slot Backplane Module (DSBP)
A3	Unable to program the optional Post Processing Module (Warp module)

Clear system errors with 'Exit Exit'. If necessary, try resetting the projector by powering it off and on again (cooling if necessary). Contact dealer/factory if error persists. Codes omitted from this table should not appear in your projector.

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Maintenance

4.1 Warnings and Safety Guidelines

The projector is an international regulatory agency approved product designed for safe and reliable operation. To assure complete safety at all times it is important to acknowledge the following precautions while operating the projector.

WARNING
Always remove the lens when shipping the projector.

WARNING
NEVER look directly into the projector lens.
The high brightness of this projector
could cause permanent eye damage.

WARNING
For protection from ultraviolet radiation, keep all projector shielding intact during operation.

Installation should be performed by qualified personnel.

Observe and follow all warnings and instructions marked on the projector.

◄ ***Labels and Markings***

The exclamation point within the equilateral triangle alerts the user to important operating and maintenance (servicing) instructions in the literature accompanying the projector.

The lightning flash and arrowhead symbol within the equilateral triangle alerts the user to uninsulated “dangerous voltage” within the projector’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

Read all operating instructions prior to using the projector.

◄ ***Instructions***

Operate the projector in an environment that meets the operating range specified in *Section 6 – Specifications*.

◄ ***Projector Location***

- Do not operate the projector close to water, such as near a swimming pool. Do not operate in extremely humid environments.
- Do not place the projector on an unstable cart, stand or table. A projector and cart combination should be used with care. Sudden stops, excessive force and uneven surfaces may cause the projector and cart combination to overturn.
- Only use Runco-approved ceiling mount fixture, if the projector is to be ceiling mounted.

Lamp: The projector uses a Cermax® Xenon lamp to deliver its high brightness. A lamp should be replaced when it has reached its end of life (1000 hrs, typical) or if a noticeable change in brightness or excessive lamp flicker occurs. Keep track of the number of hours the lamp has been in use (Lamp Menu) and be aware of any changes to brightness. These indicators will help you effectively maintain operation of the projector.

WARNING
Wait approximately 5 minutes after powering down the projector to allow internal cooling fans to stop and for the lamp to cool sufficiently before removing.
The lamp is under great pressure when hot and may explode causing physical injury and/or property damage. Allow a lamp to cool before handling or unplugging the projector.

WARNING
Use lamps of the correct wattage for your projector model when replacing.
Use only lamps supplied by Runco.

Refer to 4.4 Lamp Replacement for instructions.

Use only the attachments and/or accessories recommended by Runco. Use of others may result in the risk of fire, shock or personal injury.

WARNING
Use only the AC power cord supplied. Do not attempt operation if the AC supply is not within the specified voltage and power range.
Refer to the Specifications in Section 6.

- Do not set or rest items on the power cord. Place the projector in an area where the projector cord cannot be abused or damaged by persons walking on it or by objects rolling over it.
- Operate the projector at the specified voltage only. Do not overload power outlets and extension cords as this can result in fire or shock hazards.
- The projector is equipped with a three-wire plug having a third grounding pin. This is a safety feature – if you are unable to insert the plug into an outlet contact an electrician to have the outlet replaced. Do not defeat the safety purpose of this grounding-type plug.

◄ ***Ventilation***

Slots and vents in the projector provide ventilation. Never block or cover these openings. This ensures reliable operation of the projector and prevents overheating.

- Do not place the projector over a radiator or heat register. The projector should not be placed in an enclosure unless proper ventilation is provided.
- Do not insert objects into the ventilation openings of the projector. They may touch dangerous voltages or short-out components resulting in a fire or shock hazard. Do not spill liquids of any kind into the projector. Should an accidental spill occur, immediately unplug the projector and have it serviced by a qualified service technician.

◄ ***Servicing***

If any of the following conditions exist, immediately unplug the projector from the power outlet and ask a qualified service technician to look at it.

- The power cord has been damaged.
- The internal cooling fans do not turn on within two minutes when the projector is first powered up.
- Liquid has been spilled into the projector.
- The projector has been exposed to excessive moisture.
- The projector is not operating normally or its performance has significantly deteriorated in a short period of time.
- The projector has been dropped or the shipping case (if applicable) has been badly damaged.

WARNING

Do not attempt to service the projector yourself. All servicing must be performed by Runco accredited service technicians.

Use replacement parts that are manufacturer-approved only. Use of any other part other than the ones specified by the manufacturer can result in fire, electric shock or other damage.

4.2 Cleaning and Maintenance Guide

WARNING
Always power down and unplug the projector before cleaning or servicing.

Part Description	Frequency	Action
Lens	*As required*	**CLEAN:** Clean if absolutely necessary. A small amount of dust on the lens has very little affect on picture quality. **To clean:** Apply a solvent such as acetone, alcohol or vinegar sparingly to clean, lint-free lens tissue. Wipe across the surface of the lens. Do not scrub or rub tissue in circular motion, this will scratch the lens. Do not reuse tissue. Do not use cleaning tools treated with Ether. If particles still appear on the lens, try using compressed air to remove.
Lamp	*As required*	**CLEAN:** Clean if absolutely necessary. Never touch the glass surface of the lamp. Fingerprints left on the glass will seriously degrade lamp performance or cause “hotspots” which can lead to an accumulation of intense heat in the touched area and cause the lamp to shatter. **To clean:** Wait until lamp is cool. Moisten a clean, lint-free cotton cloth with isopropyl alcohol and gently rub the surface of the glass in a circular motion until clean.
	1000 hrs or sooner if required	**REPLACE:** Refer to 4.4 Lamp Replacement procedure later in this section.
Covers (External)	*As required*	**CLEAN:** Clean dust from external covers using a clean, lint free cotton cloth as required. *NOTE: Before cleaning the modules, it is recommended that you install the lens cap. This will keep dust particles from settling on the glass surface of the lens.*

Table 4.1. Maintenance Guide

4.3 Replacing Remote Batteries

The optional IR remote uses four AAA size, 1.5V alkaline batteries. To replace the batteries simply turn the remote over and remove the battery cover.

Remove and properly discard the old batteries. Insert new batteries in the proper positive/ negative orientation as shown etched in the bottom of the compartment (2). Replace the cover by inserting the tabbed end into the opening and snapping the opposite end into place.

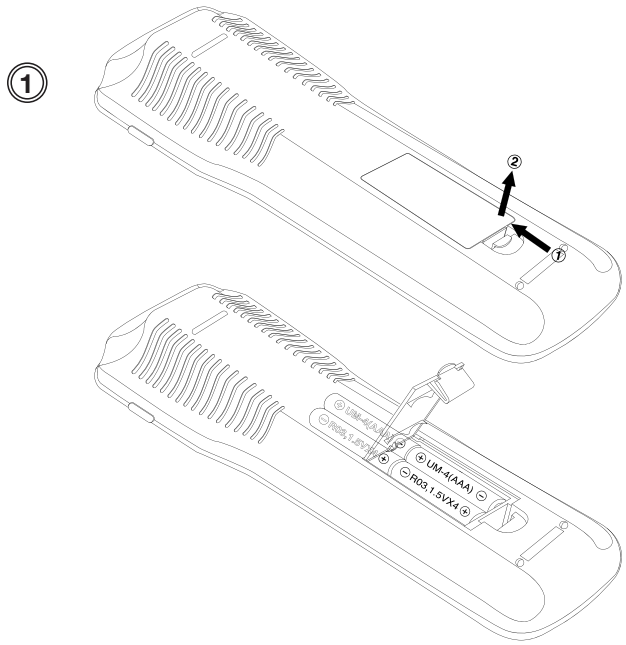


Figure 4.1. Replacing remote batteries (underside of keypad shown)

4.4 Lamp and Filter Replacement

Use the following instructions when replacing the lamp. The lamp is located at the back of the projector (below the input panel) and can be accessed by removing the lamp access panel. Use only the Runco approved *Lamp and Filter Kit* for your specific projector model. See chart below.

Projector Model	Lamp (Watts)	Part Number
Runco VX-40d	**1000W**	**RUPA-006400**
Runco VX-50d	**1200W**	**RUPA-006700**
Runco VX-60d	**1000W**	**RUPA-006800**
Runco VX-80d	**1200W**	**RUPA-006850**

A lamp should be replaced when it reaches its end of life (1000 hours, typical) or sooner if a noticeable degradation in brightness occurs (typical in aging lamps). You can set the number of hours you expect to log with the lamp before replacing it, by setting the **Lamp Limit** in the *Lamp* menu. You can also enable a warning message to appear upon powering up the projector that will indicate the lamp has reached the limit you set, by entering a checkmark beside the ***Lamp Message*** option. *NOTE: The lamp mode you choose to run the projector in may affect the lamp life.*

Tools required: #1 Phillips screwdriver

WARNING
Handle lamp with care. Lamp may explode if dropped. Wear protective clothing and safety goggles when handling lamps.

Use only Runco approved lamps provided for your projector.

1. Press to power down the projector. Wait at least 5 minutes to allow the internal cooling fans to stop before unplugging the projector. This wait period is also required to allow the lamp to sufficiently cool before handling.

WARNING
Always power down and unplug the projector prior to servicing.
Allow the lamp to cool before handling.

2. Using a screwdriver, loosen the four screws from the lamp door located at the back of the projector, below the input panel. (Figure 4.2.)

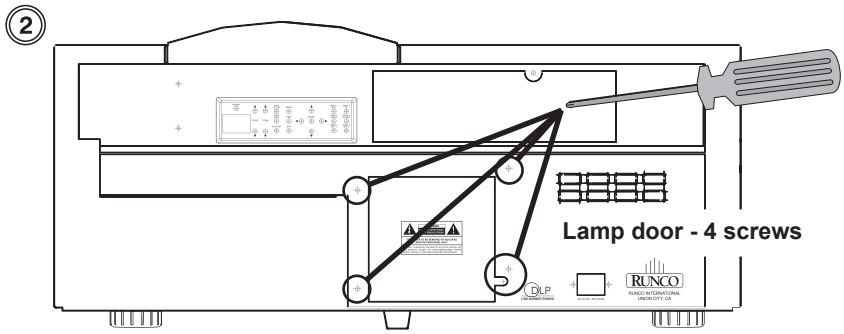


Figure 4.2. Removing the Lamp Door

3. Pull (out) and turn the lamp lock lever, which is located to the left of the lamp module, a quarter turn counter clockwise to the “unlock” position. (Figure 4.3.)

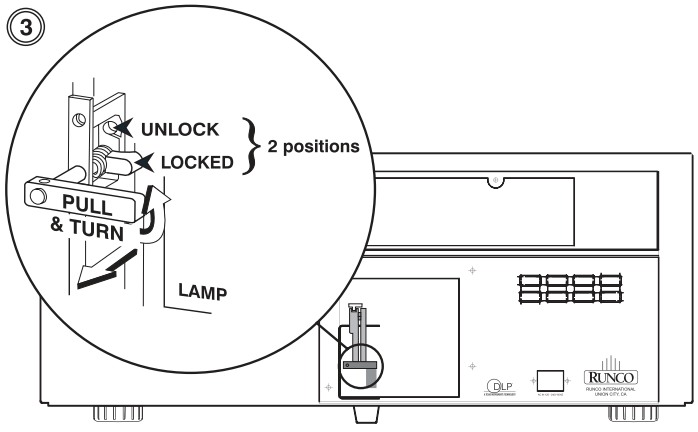


Figure 4.3. Unlocking the Lamp

4. Grasp the lamp by its housing only and pull it straight out (lamp slides along guides) until it's free. (Figure 4.4.) Discard the lamp using safe disposal/recycling practices or contact your Runco dealer for a possible re-lamping program.

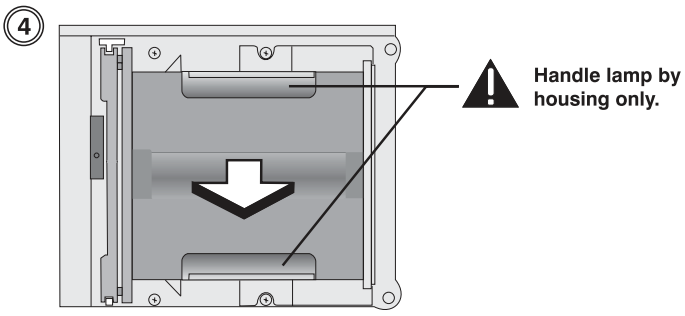


Figure 4.4. Removing the Lamp

5. Align the new lamp with the top and bottom guides on the left side of the lamp compartment. (Figure 4.5.) Slide the lamp all the way in – a slightly harder push may be required right at the end to make sure it is fully seated into the terminal block. *NOTE: The projector will not power up again if the lamp is not fully connected to the terminal block.*

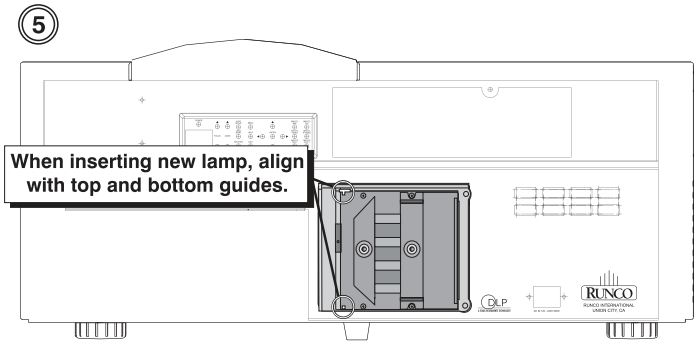


Figure 4.5. Installing a New Lamp

6. Pull (out) and turn the lamp lock lever (turned up in Step 3) a quarter turn clockwise to "lock" the lamp in place. *NOTE: If you can't turn the lamp lock into position it is likely the lamp is not fully inserted. In this case, partially remove the lamp and try pushing it back in again. Then, try switching the lock lever to the "lock" position.*

7. Replace the lamp door and tighten the four screws to secure.

8. The next time the projector is powered up, enter the new serial number of the newly installed lamp. Access the Lamp menu and select "Change Lamp."

Enter the serial number in the **Lamp S/N** text box using the numeric keypad.

4.5 Replacing the Projection Lens

Use the following instructions when replacing a projection lens:

NOTE for first time use: *The projection lens is shipped separately from the projector. Before you install a lens it is important that you remove the lens plug from the lens opening in the projector.*

1. Power down the projector and wait five minutes to allow the lamp to cool before continuing with Step 2.

2. Place the lens cap on the projection lens to protect it from being damaged during the installation or removal process. For first time installations, remove the rear cap from the lens – this protective cap is only used during shipping to protect the lens from damage.

3. ***When removing the projection lens*** – Press and hold the "lens release" button located in the top right corner of the lens panel. Grasping the lens barrel, turn it in a counter-clockwise direction until it stops. Then pull it forward to remove it (disconnects from the connector assembly).

OR

When installing a projection lens, make sure Steps 1 and 2 are complete. Slide the new lens into the lens opening of the projector – make sure to align the connector that is located on the side of the lens with the connector assembly on the lens retaining ring. As you connect the lens, you may have to re-align it slightly until the tabs on the lens will fit into the slots in the lens retaining ring. With the lens fully inserted (and connected) turn it clockwise until the lens release button "pops" indicating the lens is fully inserted.

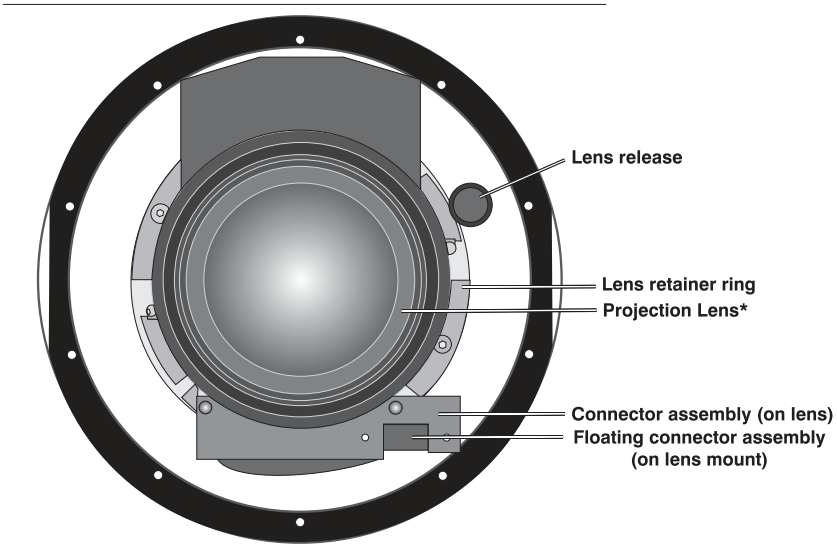
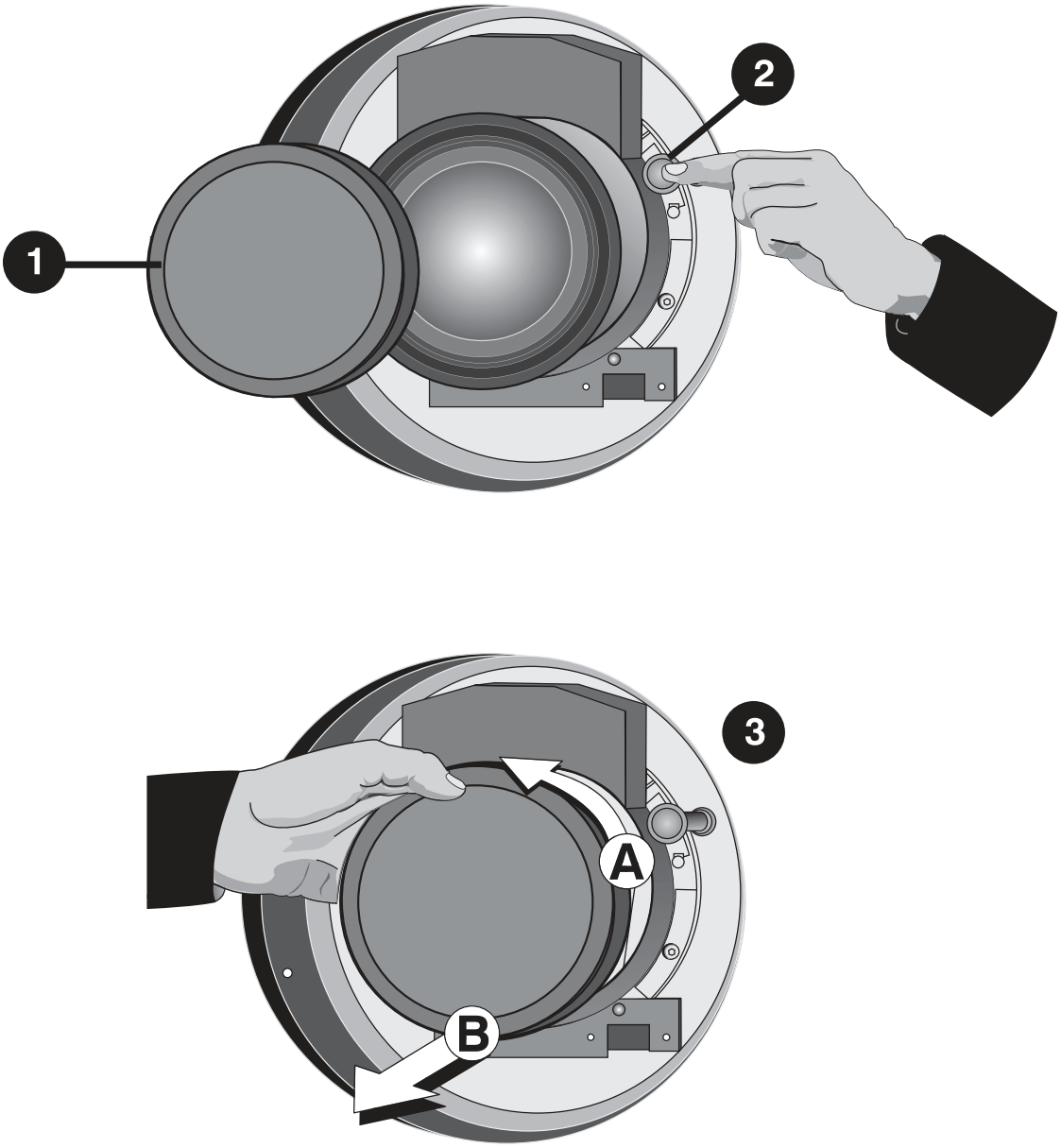


Figure 4.6. Lens Assembly (Front View)



NOTE: Connector assembly will move as you turn the lens.

Figure 4.7. Removing or Installing A Lens

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Troubleshooting

5.1 Displays

If the projector does not appear to be operating properly, note the symptoms present and use the following guide to assist you. If you cannot resolve the problems yourself, contact your dealer for assistance.

*NOTE: A **qualified Runco service technician** is required when opening the projector to diagnose any "probable cause".*

SYMPTOM	CAUSE/REMEDY
The projector is on but there's no display...	Was a lens cover accidentally left on? Remove lens cover.
	Make sure the shutter is OPEN.
	Is the lamp ignited? Check for interlock problems such as an open lamp door OR check for light spillage out the back.
	Is the correct input selected? Check cable connections.
	Check if menus appear on screen.
	Can you access test patterns? Make sure there is not a full black test pattern selected for display—press Menu to access test patterns, then cycle patterns with keys. Check your source connections again.
Severe motion artifacts...	Most likely there is a synchronization problem with reversed 3/2 pull-down in 60Hz-to-24Hz film-to-digital conversion in your source. Correct at the source.
	Was an excessive amount of keystone used?
Image appears "squeezed" or vertically stretched into center of screen	Check your Resizing selection.
	Check the DHD Controller's aspect ratio selection.
The display is jittery or unstable...	If the display is jittery or blinking erratically, ensure that the source is properly connected and of adequate quality for detection. With a poor quality or improperly connected source, the projector will repeatedly attempt to display an image, however briefly.
	The horizontal or vertical scan frequency of the input signal may be out of range for the projector. Refer to *Section 6, Specifications* for scan frequency ranges.
	The sync signal may be inadequate. Correct the source problem.
The display is faint...	Brightness and/or contrast and/or gamma may be set incorrectly.
	The source may be double terminated. Ensure the source is terminated only once.
	The source (if non-video) may need a different sync tip clamp location.
The upper portion of the display is waving, tearing or jittering...	This can sometimes occur with video or VCR sources. Check your source.

SYMPTOM	CAUSE/REMEDY
Portions of the display are cut off or wrap to the opposite edge...	Resizing and/or blanking may need adjustment.
	The horizontal or vertical scan frequency of the input signal may be out of range for the projector. Refer to Section 6, Specifications for scan frequency ranges.
The display appears compressed ...	The aspect ratio selected at the DHD Controller may be incorrect.
	Resizing, vertical stretch and positioning options may be improperly adjusted for the incoming source signal. (Example: The DVD player is set for the wrong screen type.)
Data is cropped from edges	Check settings for Blanking.
	If incoming data is still missing from the image, reduce the image size to within the display area available in the projector.
Display quality appears to drift from good to bad, bad to good...	The source input signal may be of low quality.
The display has suddenly frozen...	It's possible that excessive voltage noise on the AC or ground input has interrupted the projector's ability to lock on to a signal. Power down the projector and disconnect from AC. Then plug in again and power up as usual.
Colors in the display are inaccurate...	Try Auto Setup.
	The color, tint, color space, color temperature and/or other settings may require adjustment.
	Ensure signal connections are correct.
	Make sure you are using the proper channel for this source.
Values in Color Saturation slidebars vary over time...	Once defined, Color Saturation slidebar values fluctuate over time and will likely be different upon subsequent visits to this menu. This is normal and should be ignored, as these changes do not redefine the x/y coordinates or color gamut.
The display is not rectangular...	Check leveling of the projector. Make sure that the lens surface and screen are as parallel to each other as possible.
The display is "noisy"...	Display adjustment at your input source may be required.
	The video input may not be terminated. Make sure the video input is terminated (75Ω). If it is the last connection in a loop-through chain, the video input should be terminated at the last source input only.
	The input signal and/or signal cables carrying the input signal may be of poor quality.
	If the distance between the input source device and the projector is greater than 75 feet, signal amplification/ conditioning may be required.
	If the source is a VCR or off-air broadcast, detail may be set too high.

5.2 Lamp

SYMPTOM	CAUSE/REMEDY
Lamp does not ignite	If the lamp won't ignite, there may be an interlock failure such as an open lamp door, or failed lamp fan. An error code will display on the status LED display located on the built in keypad.
	If a temperature is too high (e.g."DMD over critical temp limit"), the lamp will not ignite until the temperature is low enough. Cool the projector and try again.
	If the lamp does not ignite after a second and third try, replace the lamp.
Lamp suddenly turns Off	Try increasing the lamp power.
	The DMDs may be overheated.
	Replace the lamp.
Flicker, Shadows or Dimness	Increase lamp power, if possible.
	Replace the lamp.
Intensity does not seem to work	Make sure "Intensity" is selected in the Lamp menu.
	If the lamp power has increased to its maximum in order to maintain an intensity setting, intensity is automatically terminated. If the values shown in the Lamp menu indicate that the lamp power has reached this "over-drive" state, either reduce your intensity setting or install a new lamp.

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Specifications

◄ ***VX-40d***

Projector Type:	Digital Light Processing™ (DLP™), 3-Chip, 16:9 Darkchip2™ DMD™
Native Resolution:	1280 x 720
Aspect Ratios:	Determined by supplied DHD Video Processor
Video Standards:	NTSC, PAL
DTV Compatibility:	480p, 720p, 1080i
Scan Frequency:	Horizontal: 15–120kHz Vertical: 23.97–150Hz
Picture Size (16:9 screens)	Recommended Width: 72–192 in. Maximum Width: 300 in.
Throw Distance (Factor x Screen Width)	Lens Option 1: Zoom 4.96–7.90 Lens Option 2: Zoom 1.65–1.95 Lens Option 3: Zoom 2.04–2.73 Lens Option 4: Zoom 2.86–4.83 Lens Option 5: Fixed 0.8 (for rear screen applications)
Horizontal and Vertical Offset:	Horizontal offset varies per lens up to 50%, Vertical offset varies per lens, up to 100%; Short Throw: H: 69%, V: 37% (Contact Runco technical support for installation details.)
Lamp:	1000W Xenon lamp module
Lamp Life:	1000 Hours @ 6,500K
Inputs:	(1) Composite, (1) S-Video, (1) DVI, (1) RGB/Component, (1) RS232, (1) RS422

VX-40d (continued) ➤		
	Brightness and Contrast:	Cinema Standards Measurement System (CSMS) Specifications - Brightness: 86 foot-Lamberts (fL) - Contrast Ratio: 232:1 to 285:1 (variable depending on lens aperture setting) These measurements are taken from the projector in a controlled, home theater environment. All measurements are made to ANSI/ NAPM IT7.228-1997 specifications using the Photo Research PR-650 SpectraColorimeter and Minolta LS-100 Luminance Meter, Video Essentials test DVD and a 1.3 gain, 72-inch wide screen. The projector is calibrated to a color temperature of 6,500K and has a minimum of 150 hours of usage. The foot-Lambert (fL) is the unit of measurement used in commercial movie theaters to express image brightness at the screen surface. The Society of Motion Picture and Television Engineers (SMPTE) specifies 16 fL as the target image brightness for film-based projectors using an open gate (without film in the projector). More importantly, today SMPTE specifies 12 fL as the target image brightness in Digital Cinema theaters. The foot-Lambert measurement is dependent on screen size, screen gain and projector light output.
		Home Theater Calibration Specifications - Light Output: 2180 ANSI Lumens - Contrast Ratio: 232:1 to 285:1 These specifications are obtained by calibrating the projector as described above for CSMS measurements.
		Industry-Standard Specifications - Light Output: 4000 ANSI Lumens - Contrast Ratio: 1500:1 to 1800:1 These are typical projector brightness and contrast specifications found in most companies' sales literature. Runco includes these measurements in its literature to allow for direct comparison with other manufacturers' projectors. These measurements are typically taken at 9,000K to 13,000K to get expected performance data when the projector is used in professional, commercial and industrial displays.
	12V Output:	See Controller for Specifications
	Power Requirements:	100-240V AC, 50/60Hz, 1700W
	Operating Environments:	40 to 95ºF (5 to 35ºC); 20-80% humidity (non-condensing)
	Dimensions (w/o feet):	Width: 29.03 in. (737 mm) Depth: 28.23 in. (717 mm) Height: 12.24 in. (311 mm)
	Weight (without lens):	85 lbs. (38.55 kg)
	Regulatory Approvals:	Complies with FCC Class B, CE, C-Tick
	Limited Warranty:	Projector: Two (2) years parts and labor from the date of delivery to the end user. Lamp Warranty: 1000 hours or six (6) months, whichever comes first.

◄ ***VX-50d***

Projector Type:	Digital Light Processing™ (DLP™), 3-Chip, 16:9 Darkchip2™ DMD™
Native Resolution:	1280 x 720
Aspect Ratios:	Determined by supplied DHD Video Processor
Video Standards:	NTSC, PAL
DTV Compatibility:	480p, 720p, 1080i
Scan Frequency:	Horizontal: 15–120kHz Vertical: 23.97–150Hz
Picture Size (16:9 screens)	Recommended Width: 72–240 in. Maximum Width: 350 in.
Throw Distance (Factor x Screen Width)	Lens Option 1: Zoom 4.96–7.90 Lens Option 2: Zoom 1.65–1.95 Lens Option 3: Zoom 2.04–2.73 Lens Option 4: Zoom 2.86–4.83 Lens Option 5: Fixed 0.8 (for rear screen applications)
Horizontal and Vertical Offset:	Horizontal offset varies per lens up to 50%, Vertical offset varies per lens, up to 100%; Short Throw: H: 69%, V: 37% (Contact Runco technical support for installation details.)
Lamp:	1.2kW Xenon lamp module
Lamp Life:	1000 Hours @ 6,500K
Inputs:	(1) Composite, (1) S-Video, (1) DVI, (1) RGB/Component, (1) RS232, (1) RS422

VX-50d (continued) ➤	Brightness and Contrast:	Cinema Standards Measurement System (CSMS) Specifications - Brightness: 107.3 foot-Lamberts (fL) - Contrast Ratio: 229:1 to 279:1 (variable depending on lens aperture setting) These measurements are taken from the projector in a controlled, home theater environment. All measurements are made to ANSI/ NAPM IT7.228-1997 specifications using the Photo Research PR-650 SpectraColorimeter and Minolta LS-100 Luminance Meter, Video Essentials test DVD and a 1.3 gain, 72-inch wide screen. The projector is calibrated to a color temperature of 6,500K and has a minimum of 150 hours of usage. The foot-Lambert (fL) is the unit of measurement used in commercial movie theaters to express image brightness at the screen surface. The Society of Motion Picture and Television Engineers (SMPTE) specifies 16 fL as the target image brightness for film-based projectors using an open gate (without film in the projector). More importantly, today SMPTE specifies 12 fL as the target image brightness in Digital Cinema theaters. The foot-Lambert measurement is dependent on screen size, screen gain and projector light output.
		Home Theater Calibration Specifications - Light Output: 3462 ANSI Lumens - Contrast Ratio: 229:1 to 279:1 These specifications are obtained by calibrating the projector as described above for CSMS measurements.
		Industry-Standard Specifications - Light Output: 6000 ANSI Lumens - Contrast Ratio: 1500:1 to 1800:1 These are typical projector brightness and contrast specifications found in most companies' sales literature. Runco includes these measurements in its literature to allow for direct comparison with other manufacturers' projectors. These measurements are typically taken at 9,000K to 13,000K to get expected performance data when the projector is used in professional, commercial and industrial displays.
	12V Output:	See Controller for Specifications
	Power Requirements:	200-240V AC, 50/60Hz, 2100W
	Operating Environments:	40 to 95ºF (5 to 35ºC); 20-80% humidity (non-condensing)
	Dimensions (w/o feet):	Width: 29.03 in. (737 mm) Depth: 28.23 in. (717 mm) Height: 12.24 in. (311 mm)
	Weight (without lens):	89 lbs. (40.37 kg)
	Regulatory Approvals:	Complies with FCC Class B, CE, C-Tick
	Limited Warranty:	Projector: Two (2) years parts and labor from the date of delivery to the end user. Lamp Warranty: 1000 hours or six (6) months, whichever comes first.

◄ ***VX-60d***

Projector Type:	Digital Light Processing™ (DLP™), 3-Chip, Darkchip2™ DMD™
Native Resolution:	1400 x 1050
Aspect Ratios:	Determined by Supplied DHD Video Processor
Video Standards:	NTSC, PAL
DTV Compatibility:	480p, 720p, 1080i
Scan Frequency:	Horizontal: 15–120kHz Vertical: 23.97–150Hz
Picture Size (16:9 screens)	Recommended Width: 72–192 in. Maximum Width: 300 in.
Throw Distance (Factor x Screen Width)	Lens Option 1: Zoom 4.48–7.15 Lens Option 2: Zoom 1.48–1.75 Lens Option 3: Zoom 1.81–2.40 Lens Option 4: Zoom 2.56–4.35 Lens Option 5: Fixed 0.75 (for rear screen applications)
Horizontal and Vertical Offset:	Horizontal offset varies per lens up to 50%, Vertical offset varies per lens, up to 100%; Short Throw: H: 69%, V: 37% (Contact Runco technical support for installation details.)
Lamp:	1000W Xenon lamp module
Lamp Life:	1000 Hours @ 6500K
Inputs:	(1) Composite, (1) S-Video, (1) DVI, (1) RGB/ Component, (1) RS232, (1) RS422

VX-60d (continued) ➤		
	Brightness and Contrast:	Cinema Standards Measurement System (CSMS) Specifications - Brightness: 94 foot-Lamberts (fL) - Contrast Ratio: 227:1 to 282:1 (variable depending on lens aperture setting) These measurements are taken from the projector in a controlled, home theater environment. All measurements are made to ANSI/ NAPM IT7.228-1997 specifications using the Photo Research PR-650 SpectraColorimeter and Minolta LS-100 Luminance Meter, Video Essentials test DVD and a 1.3 gain, 72-inch wide screen. The projector is calibrated to a color temperature of 6,500K and has a minimum of 150 hours of usage. The foot-Lambert (fL) is the unit of measurement used in commercial movie theaters to express image brightness at the screen surface. The Society of Motion Picture and Television Engineers (SMPTE) specifies 16 fL as the target image brightness for film-based projectors using an open gate (without film in the projector). More importantly, today SMPTE specifies 12 fL as the target image brightness in Digital Cinema theaters. The foot-Lambert measurement is dependent on screen size, screen gain and projector light output.
		Home Theater Calibration Specifications - Light Output: 2360 ANSI Lumens - Contrast Ratio: 227:1 to 282:1 These specifications are obtained by calibrating the projector as described above for CSMS measurements.
		Industry-Standard Specifications - Light Output: 4000 ANSI Lumens - Contrast Ratio: 1500:1 to 1800:1 These are typical projector brightness and contrast specifications found in most companies' sales literature. Runco includes these measurements in its literature to allow for direct comparison with other manufacturers' projectors. These measurements are typically taken at 9,000K to 13,000K to get expected performance data when the projector is used in professional, commercial and industrial displays.
	12V Output:	See Controller for Specifications
	Power Requirements:	100-240V AC, 50/60Hz, 1700W
	Operating Environments:	40 to 95ºF (5 to 35ºC); 20-80% humidity (non-condensing)
	Dimensions (w/o feet):	Width: 29.03 in. (737 mm) Depth: 28.23 in. (717 mm) Height: 12.24 in. (311 mm)
	Weight (without lens):	85 lbs. (38.55 kg)
	Regulatory Approvals:	Complies with FCC Class B, CE, C-Tick
	Limited Warranty:	Projector: Two (2) years parts and labor from the date of delivery to the end user. Lamp Warranty: 1000 hours or six (6) months, whichever comes first.

◄ ***VX-80d***

Projector Type:	Digital Light Processing™ (DLP™), 3-Chip, Darkchip2™ DMD™
Native Resolution:	1400 x 1050
Aspect Ratios:	Determined by Supplied DHD Video Processor
Video Standards:	NTSC, PAL
DTV Compatibility:	480p, 720p, 1080i
Scan Frequency:	Horizontal: 15–120kHz Vertical: 23.97–150Hz
Picture Size (16:9 screens)	Recommended Width: 72–288 in. Maximum Width: 375 in.
Throw Distance (Factor x Screen Width)	Lens Option 1: Zoom 4.48–7.15 Lens Option 2: Zoom 1.48–1.75 Lens Option 3: Zoom 1.81–2.40 Lens Option 4: Zoom 2.56–4.35 Lens Option 5: Fixed 0.75 (for rear screen applications)
Horizontal and Vertical Offset:	Horizontal offset varies per lens up to 50%, Vertical offset varies per lens, up to 100%; Short Throw: H: 69%, V: 37% (Contact Runco technical support for installation details.)
Lamp:	1.2kW Xenon lamp module
Lamp Life:	1000 Hours @ 6500K
Inputs:	(1) Composite, (1) S-Video, (1) DVI, (1) RGB/ Component, (1) RS232, (1) RS422

VX-80d (continued) ➤

Brightness and Contrast:	Cinema Standards Measurement System (CSMS) Specifications - Brightness: 188.6 foot-Lamberts (fL) - Contrast Ratio: 225:1 to 277:1 (variable depending on lens aperture setting) These measurements are taken from the projector in a controlled, home theater environment. All measurements are made to ANSI/ NAPM IT7.228-1997 specifications using the Photo Research PR-650 SpectraColorimeter and Minolta LS-100 Luminance Meter, Video Essentials test DVD and a 1.3 gain, 72-inch wide screen. The projector is calibrated to a color temperature of 6,500K and has a minimum of 150 hours of usage. The foot-Lambert (fL) is the unit of measurement used in commercial movie theaters to express image brightness at the screen surface. The Society of Motion Picture and Television Engineers (SMPTE) specifies 16 fL as the target image brightness for film-based projectors using an open gate (without film in the projector). More importantly, today SMPTE specifies 12 fL as the target image brightness in Digital Cinema theaters. The foot-Lambert measurement is dependent on screen size, screen gain and projector light output.
	Home Theater Calibration Specifications - Light Output: 5740 ANSI Lumens - Contrast Ratio: 225:1 to 277:1 These specifications are obtained by calibrating the projector as described above for CSMS measurements.
	Industry-Standard Specifications - Light Output: 8000 ANSI Lumens - Contrast Ratio: 1500:1 to 1800:1 These are typical projector brightness and contrast specifications found in most companies' sales literature. Runco includes these measurements in its literature to allow for direct comparison with other manufacturers' projectors. These measurements are typically taken at 9,000K to 13,000K to get expected performance data when the projector is used in professional, commercial and industrial displays.
12V Output:	See Controller for Specifications
Power Requirements:	200-240V AC, 50/60Hz, 2100W
Operating Environments:	40 to 95ºF (5 to 35ºC); 20-80% humidity (non-condensing)
Dimensions (w/o feet):	Width: 29.03 in. (737 mm) Depth: 28.23 in. (717 mm) Height: 12.24 in. (311 mm)
Weight (without lens):	89 lbs. (40.37 kg)
Regulatory Approvals:	Complies with FCC Class B, CE, C-Tick
Limited Warranty:	Projector: Two (2) years parts and labor from the date of delivery to the end user. Lamp Warranty: 1000 hours or six (6) months, whichever comes first.

Glossary

This appendix defines the specific terms used in this manual as they apply to this projector.
Also included are other general terms commonly used in the projection industry.

Active Line Time ➤	The time, inside one horizontal scan line, during which video is generated.
Ambient Light Rejection ➤	The ability of a screen to reflect ambient light in a direction away from the "line of best viewing". Curved screens usually have good ambient light rejection. Flat screens usually have less ambient light rejection.
Analog Video ➤	The video output of most computers and videotape machines. Analog video can generate a large number of colors.
Anamorphic ➤	Having or requiring a linear distortion, generally in the horizontal direction. Anamorphic lenses can restore a 'scope' (CinemaScope) or 'flat' format film frame to the correct wide-screen appearance by increasing its horizontal proportion.
ANSI ➤	The American National Standards Institute is the organization that denotes the measurement standard for lamp brightness.
Aspect Ratio ➤	The ratio of the width of an image to its height, such as the 4:3 aspect ratio common in video output. Can also be expressed as a decimal number, such as 1.77, 1.85 or 2.39. The larger the ratio or decimal, the wider and "less square" the image.
Auto Source ➤	The ability of the projector to automatically recognize and synchronize to the horizontal and vertical scan frequencies of an input signal for proper display.
Bandwidth ➤	The frequency range of the projector's video amplifier.
Baud Rate ➤	The speed (bits-per-second) at which serial communications travel from their origin.
Blanking Time ➤	The time inside one scan line during which video is not generated. The blanking time of the input signal must be equal to or greater than the retrace time of the projector.
Brightness ➤	In projection, brightness usually describes the amount of light emitted from a surface such as a screen. It is measured in foot-lamberts or candelas per square meter.
Candela or Candle ➤	Unit of measure for measuring intensity of light.
Channel ➤	A collection of measurements stored by the projector for a given input source, including frequencies, pulse width, polarity, syncs, channel number and location, user adjustable display settings, etc. Use channels to switch between a variety of setups quickly, automatically recalling previously defined display parameters.
Channel List ➤	A list/menu of previously-defined channels available in projector memory.
Channel Number ➤	A number that uniquely identifies a specific channel retained in projector memory. The projector can retain up to 99 channels.
Checkbox ➤	A menu item that indicates whether an option is currently in effect (checked) or not (unchecked).
Chrominance ➤	The signal representing the color information (hue and saturation) when the image is represented as separate chrominance and luminance. Same as "chroma".
Color Gamut ➤	The range of colors allowed in a specific system, as defined within a triangular area located on the CIE color locus diagram whose corners are the three primaries defined in the system. Also known as color space.
Color Shift ➤	A change in the tint of a white field across an image.

Color Temperature ➤	The coloration (reddish, white, bluish, greenish, etc.) of white in an image, measured using the Kelvin (degrees K) temperature scale. Higher temperatures output more light.
Component Video ➤	See YCbCr or YPbPr.
Composite Video ➤	The output of video tape players and some computers, characterized by synchronization, luminance and color signals combined on one output cable.
Contrast (ratio) ➤	The degree of difference between the lightest and darkest areas of the image.
Convergence ➤	The alignment of the red, green, and blue elements of a projected image so that they appear as a single element.
CSMS ➤	The Cinema Standards Measurement System (CSMS) is a method of measuring home theater projector light output in terms that Runco believes can be better understood by the typical consumer. It consists of three separate measurement steps to provide three separate ratings for the projector: ANSI Lumens, ANSI Home Theater Lumens and Foot-Lamberts.
Curved Screen ➤	A projection screen which is slightly concave for improved screen gain. Curved screens usually have screen gains, which are greater than 1 but viewing angles much less than 180°. Curved screens are not recommended for use with this projector.
DDC ➤	The Display Data Channel VESA standard enables communication between PCs and monitors, and is based on E-EDID protocol.
DDI ➤	A “direct digital interface” signal can be supplied to the projector via an optional digital input module installed in INPUT 5. For example, you can input an SMPTE- 259M signal using a Serial Digital Input Module or input an SMPTE-272M signal from a Digital HDTV Serial Input Module.
DMD™ ➤	Digital Micromirror Devices™ used in this projector for processing red, green and blue color data.
Decoder ➤	Located at INPUT 3 and INPUT 4, this device converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M, or SECAM to RGB video.
Detail ➤	The sharpness of a display from a video source.
Diffused Screen ➤	A type of rear-projection screen which spreads the light striking it. Screen gain is less than 1 but audience viewing angles are increased.
Display Setting ➤	An adjustment that affects the display of an image. Such display settings include contrast, brightness, tint, blanking, size, offsets, and others.
Dot Clock ➤	The maximum frequency of the pixel clock. Also known as pixel clock rate.
E-EDID ➤	The Enhanced Extended Display Identification Data standard, established by VESA, enables properties (such as resolution) of a display device to be detected by the display card in a controlling device such as a PC. The PC, in turn, can then output in a matching format to fill the display. Some sources used with the projector are VESA EEDID reported.
Flicker ➤	A very rapid variation in image brightness caused by a frame rate that is too slow. (See Interlace) See also Lamp Flicker.
Foot-Candle ➤	The intensity of visible light per square foot.
Foot-Lambert ➤	The luminance (brightness) which results from one foot-candle of illumination falling on a perfectly diffuse surface.
Frame Rate ➤	The frequency at which complete images are generated. For non-interlaced signals, the frame rate is identical to the vertical frequency. For interlaced signals, the frame rate (also known as field rate) is one half of vertical frequency.

Gain or Screen Gain ➤	The ability of a screen to direct incident light to an audience. A flat matte white wall has a gain of approximately 1. Screens with gain less than 1 attenuate incident light; screens with gain more than 1 direct more incident light to the audience but have a narrow viewing angle. For example: An image reflecting off a 10 gain screen appears 10 times brighter than it would if reflected off a matte white wall. Curved screens usually have larger gain than flat screens.
HDCP ➤	High-bandwidth Digital Content Protection (HDCP) is a specification developed by the Intel® corporation for protecting digital entertainment content that uses a digital visual interface (DVI). HDCP encrypts the transmission of digital content (signal) between the video source and the digital display. HDCP does not prevent the copying or recording of digital content; it only protects the integrity of content as it is transmitted.
HDTV ➤	High-definition Television (1035, 1080 and 1125 lines interlace, and 720 and 1080 line progressive formats with a 16:9 (i.e. 1.77) aspect ratio.
Help Text ➤	A display of help information regarding the current task or presentation.
Horizontal Frequency ➤	The frequency at which scan lines are generated, which varies amongst sources. Also called horizontal scan rate or line rate.
Horizontal Offset ➤	The difference between the center of the projected image and the center of the projector lens. For clarity, offset is often expressed as the maximum amount of the image that can be projected to one side of the lens center without degrading the image quality. Horizontal offset ranges can be affected by the type of lens in use, and whether or not the image is offset vertically at the same time.
Hot Spot ➤	A circular area of a screen where the image appears brighter than elsewhere on the screen. A hot spot appears along the line of sight and “moves” with the line of sight. High gain screens and rear screens designed for slide or movie projection usually have a hot spot.
Input ➤	A physical connection route for a source signal, described by a 2-digit number representing 1) its switcher/projector location and 2) its slot in the switcher/projector.
Input Signal ➤	Signal sent from a source device to the projector.
Interface ➤	A device, such as the Serial Digital Input Module, that accepts an input signal for display by the projector.
Interlace ➤	A method used by video tape players and some computers to double the vertical resolution without increasing the horizontal line rate. If the resulting frame/field rate is too low, the image may flicker depending on the image content.
Keypad ➤	A small push-button device for controlling most projector settings and operation. For more information, refer to 3.3, Using the Keypad.
Keystone ➤	A distortion of the image which occurs when the top and bottom borders of the image are unequal in length. Side borders both slant in or out, producing a “keyhole” shaped image. It is caused when the screen and lens surface are not parallel, or by poor Keystone adjustment.
Lamp Flicker ➤	As the lamp ages, the shape of two anodes may change from two points to a flattened state. When this occurs, the arc jumps across the gap from varying points. This is seen as image flicker. Turning the Lamp Conditioning feature ON will pulse the lamp and gradually “condition” the two anodes back to two points. Lamp Conditioning may take seconds, minutes or hours to reach full effectiveness. NOTE: Lamp flicker can occur at any time in the lamps life. The length of time, over which flicker may occur varies considerably and unpredictably. This behavior is inherent in UHP lamps.
Linearity ➤	The reproduction of the horizontal and vertical size of characters and/or shapes over the entire screen.

Appendix A: Glossary

Line of Best Viewing ➤	When light from a projector is incident on a screen, the light reflects from the screen such that the angle of reflection equals the angle of incidence. The Line of Best Viewing is along the line of reflection.
Loopthrough (Loopthru) ➤	The method of feeding a series of high impedance inputs from a single video source with a coaxial transmission line in such a manner that the line is terminated with its characteristic impedance at the last input on the line.
Lumen ➤	The unit of measure for the amount of visible light emitted by a light source.
Luminance ➤	The signal representing the measurable intensity (comparable to brightness) of an electronic image when the image is represented as separate chrominance and luminance. Luminance also expresses the light intensity of a diffuse source as a function of its area; measured in lumens or candles per square foot (1 lumen per square foot = 1 foot-lambert). SMPTE RP 98 calls for a luminance of 12 to 22 foot-lamberts for theatre screens. See: Foot-lambert.
Lux ➤	The amount of visible light per square meter incident on a surface. 1 lux = 1 lumen/square meter = 0.093 foot-candles
Menu ➤	A list of selectable options displayed on the screen.
NTSC Video ➤	A video output format of some video tape and disk players. There are two types of NTSC (National Television Standards Committee) video: NTSC 3.58 and NTSC 4.43. NTSC 3.58 is used primarily in North America and Japan. NTSC 4.43 is less commonly used.
Optical Screen ➤	A type of rear-projection screen which re-directs light through the screen to increase image brightness in front of the screen. Screen gain is usually greater than 1 but audience viewing angles are reduced.
PAL Video ➤	PAL (Phase Alternating Line) video is a 50 Hz standard with 768 x 576 resolution. It is found on some video tape and disk players (used primarily in Europe, China and some South American and African countries).
Pixel ➤	The smallest discernible element of data from a computer-generated image.
Pixel Phase ➤	The phase of the pixel sampling clock relative to incoming data.
Pixel Tracking ➤	The frequency of the pixel sampling clock, indicated by the number of pixels per line.
Projector-to-Screen Distance ➤	The distance between the projector's lens and the screen. Also called "Throw Distance".
Protocol ➤	The syntax used by the communication system.
Pull-down List ➤	A selectable menu item that unfolds into a list of options pertaining to it.
Rear Screen ➤	A translucent panel for screen projection. Incident light travels through the incident surface of a rear screen and forms an image on the other surface.
Resizing ➤	The ability to manipulate through software commands the physical size, placement and/or aspect ratio of an image.
Resolution (lens) ➤	The maximum number of alternate white and black horizontal lines that can be distinguished on a screen when a photographic target is placed between the lens and a light source and illuminated by that source.
Resolution (projector) ➤	The maximum number of pixels that the projector can display horizontally and vertically across an image, such as 1024 x 768 (called XGA).
Retrace Time (Horizontal) ➤	The minimum time required for a CRT projector to move the position of the scanning spot from the right edge to the left edge.
Rise Time ➤	The time required by the video amplifier of the projector to increase its output from 10% to 90% of the maximum value.

Appendix A: Glossary

RGB Video ➤	The video output (analog or digital) of most computers. Analog RGB video can have 3, 4, or 5 wires — one each for red, green, and blue, and either none, one or two for sync. For three-wire RGB, the green wire usually provides sync. (See TTL Video).
RS232 ➤	A common asynchronous data transmission standard recommended by the Electronics Industries Association (EIA). Also called serial communication.
RS422 ➤	A less common asynchronous data transmission standard in which balanced differential voltage is specified. RS422 is especially suited to long distances.
S-Video ➤	The output from certain video tape players and video equipment. S-Video separates sync and luminance from color information, typically producing a higher quality display than composite video.
Scan Frequency ➤	The horizontal or vertical frequency at which images are generated. Also known as scan rate or refresh rate.
Scan Line ➤	One horizontal line on the display.
Scan Rate ➤	The horizontal or vertical frequency at which images are generated.
SECAM ➤	A video output format of some video tape and disk players (used primarily in France). SECAM (Sequential Couleur avec Mémoire) signals are similar in resolution and frequency to PAL signals. The primary difference between the two standards is in the way color information is encoded.
Slidebar ➤	A slidebar is a graphical display of an adjustable setting. The numerical setting often represents a percentage but can be a specific unit such as degrees Kelvin.
Source ➤	The device, such as a computer or VCR, connected to the projector for display. A source may have numerous corresponding channels defined and recognized by the projector. See Input.
Source Setup ➤	See Channel.
Switcher ➤	A signal selector that can be connected to a projector for the purpose of adding more sources.
Sync ➤	This term refers to the part of the video signal that is used to stabilize the picture. Sync can occur in three forms:
	1) "Composite sync": the horizontal and vertical components are together on one cable.
	2) "Sync-on-green": the sync is part of the green video.
	3) "Separate sync" or "H.SYNC and V.SYNC": the horizontal and vertical components of the sync are on two separate cables.
Sync Width ➤	The duration of each sync pulse generated by a computer. The sync width is part of the blanking time.
TTL Video ➤	A type of RGB video with digital characteristics.
Terminated ➤	A wire connecting a single video source to a display device, such as a projector, must be terminated by a resistance (usually 75Ω for video).
Throw Distance ➤	The distance between the projector's lens and the screen. Also called "Projector-to-Screen Distance". Always use the correct Runco throw distance formula to calculate the proper throw distance required for your lens.
Throw Ratio ➤	Throw ratio = throw distance / screen width. Typically used to differentiate lenses.
Tint ➤	Balance of red-to-green necessary for realistic representation of NTSC signals.
Variable Scan ➤	The ability of a projector to synchronize to inputs with frequencies within a specified range.
Vertical Frequency ➤	The frequency at which images are generated. Vertical frequencies vary amongst sources. Also called vertical scan rate.

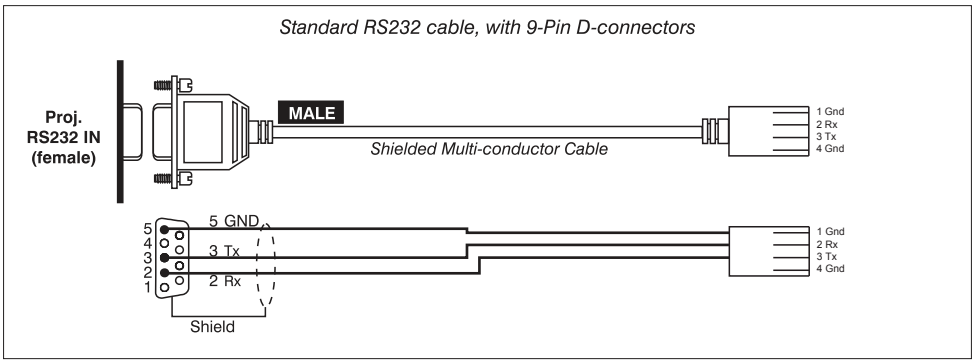
Vertical Offset ➤	The difference between the center of the projected image and the center of the projector lens. For clarity, offset is often expressed as the maximum amount of the image that can be projected above or below the lens center without degrading the image quality. Vertical offset ranges depend on the type of lens in use, and whether or not the image is offset horizontally at the same time.
Video ➤	The signal that is used by display devices (such as projectors) to generate an image. This term also refers to the output of video tape/disk players and computers.
Video Decoder ➤	An optional device that converts NTSC 3.58, NTSC 4.4, PAL, PAL-N, PAL-M or SECAM to RGB video.
Video Standard ➤	A specific type of video signal, such as NTSC, PAL, SECAM. This projector can automatically recognize and interpret the incoming standard and display accordingly.
Viewing Angle ➤	Screens do not reflect equally in all directions. Most light is reflected in a conical volume centered around the “line of best viewing”. Maximum brightness is perceived if you are within the viewing cone defined by the horizontal and vertical viewing angles.
White Balance ➤	The color temperature of white used by the projector.
White Field ➤	The area of an image that is white only. For example, a full white field is an image that is white everywhere. A 10% white field is a white area (usually rectangular) that occupies 10% of the image; the remaining 90% is black.
YCbCr ➤	A high-end digital component video signal.
YPbPr ➤	A high-end analog component video signal. Sometimes called YUV, Component, or Y, R-Y, B-Y, the YPbPr signal by-passes the video decoder in this projector.
YUV ➤	See YPbPr.
Zoom ➤	The adjustment of image size by means of a zoom lens.

Serial Communications Cables

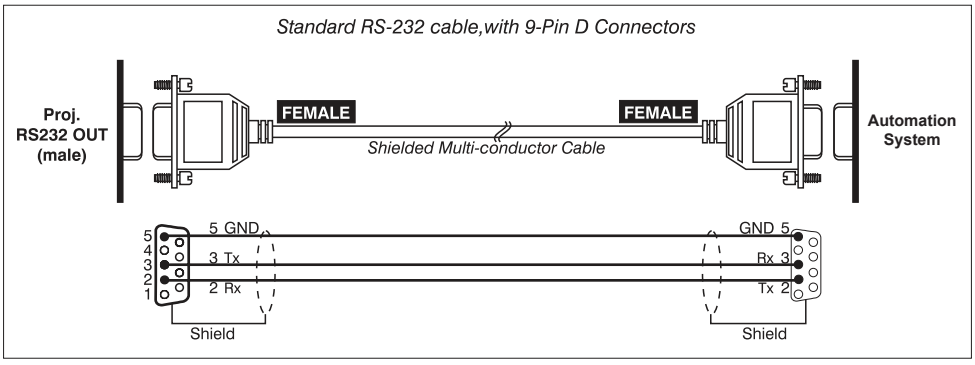
A serial link of RS232 or RS422 enables ASCII communication with the projector so that it can be controlled remotely from a PC or other controller. From a PC, connect a standard 9-wire RS232 serial cable to the **RS232 IN** port. Or, for long-distance (>100 ft.) links with an RS422-compatible PC or controller, connect RS422 cable to the **RS422** port.

❑ *From projector to DHD Controller (RS232)*

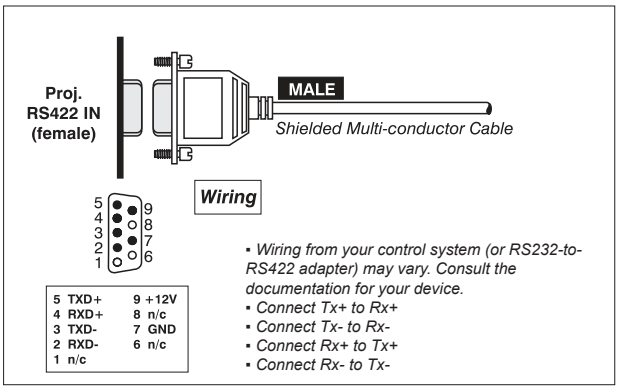
For computers having a 9-pin "AT" type serial port



❑ *From projector to Automation System*



❑ *From projector to RS422 compatible control system*



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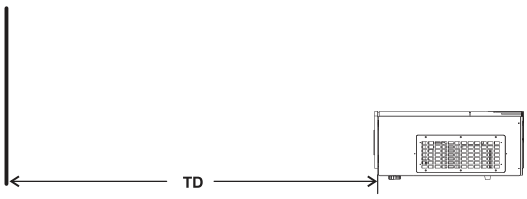
Throw Distance

Calculating Throw Distance

It is important throw distance be precisely calculated for your installation using the appropriate formula from the chart below. To calculate throw distance you must know the screen size and the lens type installed in the projector. In general, the larger you want the image to be the greater the distance you must allow between the lens and the screen.

NOTES: **1)** *Throw distance is measured from the screen to the center of the projector's lens.* **2)** *This measurement is not necessarily parallel to the floor as the projector and/or screen may be inclined.*



Throw Distance (TD) is measured from the screen to the center of the projector's lens.

Throw Distance (TD) = (Screen Width (w) X Lens Throw Ratio

Lens Option	VX-40d / VX-50d Throw Distances	VX-60d / VX-80d Throw Distances
1	1.65 - 1.95	1.48 - 1.75
2	2.04 - 2.73	1.81 - 2.40
3	2.86 - 4.83	2.56 - 4.35
4	4.96 - 7.90	4.48 - 7.15
5	0.8 (Approx.)	0.75 (Approx.)

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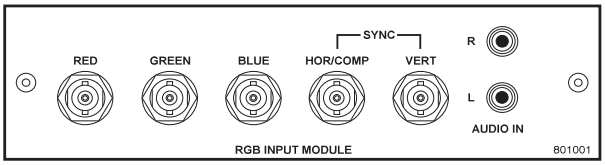
Optional Input Modules

There are many optional input modules and accessories currently available for this projector. Contact your dealer for a complete and up-to-date listing.

➤ *RGB500 Input Module*

The *RGB500 Input Module* may be installed in this projector, a *Marquee Signal Switcher*, or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from computers or other RGB source devices.



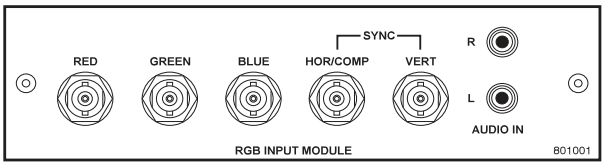
RGB500 Features

- accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync), up to 500 MHz bandwidth
- accepts YPbPr, composite (on green) and Y/C (on red/blue)
- BNC connectors for RGB signal inputs

NOTE: The audio connectors are not functional.

➤ *RGB400BA Input Module*

The *RGB400 Buffered Amplifier Input Module* may be installed in this projector, in a *Marquee Signal Switcher* or in a *Marquee Case/Power Supply*. Connect three-, four-, or five-wire RGB video signals of up to 400 MHz bandwidth, signals typically produced by high-resolution computer or workstations. The buffering capability of the module enables the incoming signal to be sent to a remote destination. Inputs are 75Ω terminated.



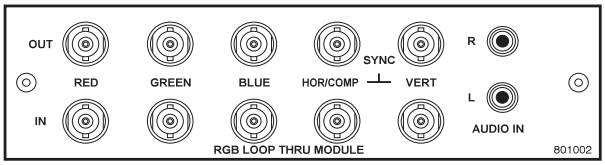
RGB400BA Features

- accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- accepts YPbPr, composite (on green) and Y/C (on red/blue)
- BNC connectors for RGB signal inputs
- Buffered signals to a remote destination

NOTE: The audio connectors are not functional.

RGB400 Active Loop-Thru ➤ Input Module

The *RGB400 ALT Input Module* may be installed in this projector, a *Marquee Signal Switcher*, or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from computers or other RGB source devices. Video inputs are 75Ω terminated. Video outputs provide buffered loop-through to another display device.



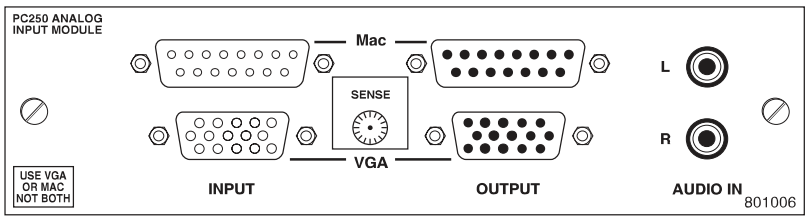
RGB400ALT Features

- accepts 3, 4, or 5 wire RGB video (sync-on-green, composite sync, or separate horizontal and vertical sync)
- accepts YPbPr, composite (on green) and Y/C (on red/blue)
- BNC connectors for RGB signal inputs
- buffered loop-through video outputs

NOTE: The audio connectors are not functional.

PC250 Analog Input Module ➤

The *PC250 Analog Input Module* may be installed in this projector, a *Marquee Signal Switcher* or a *Marquee Case/Power Supply*. The module receives analog RGB input signals from IBM PC compatibles or Macintosh computers. Video inputs are 75Ω terminated. Video outputs are provided for buffered loop-through to another display device.



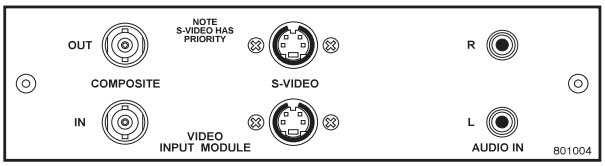
PC250 Analog Features

- accepts VGA or MAC RGB video
- 15 pin D connectors for video
- active loop-through video outputs

*NOTES: **1)** This interface does not accept VGA and MAC signals simultaneously. **2)** The audio connectors are not functional. **3)** Trademarks are the rights of their respective owners.*

➤ *Composite / S-Video Input Module*

The module receives either composite video or S-video input signals from tape or disk players (do not connect both types of signals simultaneously). Video inputs are 75Ω terminated. Video outputs are provided for buffered loop-through to another display device.



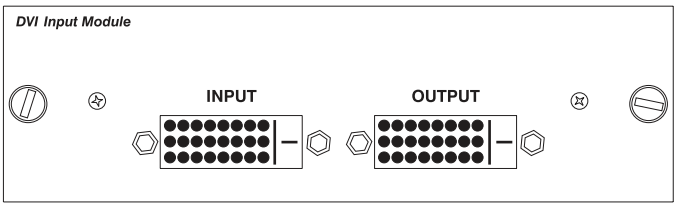
Composite/S-video Features

- BNC connectors for composite RGB signals
- 4-pin mini-DIN connectors for S-Video signals
- buffered loop-through video outputs

NOTES:
1) *This interface is not a decoder. NTSC, PAL, or SECAM signals must connect to the video decoder installed at INPUT 3 / INPUT 4.*
2) *The audio connectors are not functional.*
3) *Do not connect both composite video and S-video signals to the Composite / S-Video Input Module. Connect one or the other, even when plugged into a switcher.*

➤ *DVI Input Module*

This module can display digital video input signals conforming to the DVI (Digital Visual Interface) single-channel standard.



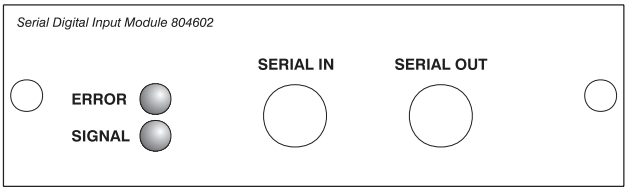
Features

- supports Digital Visual Interface (DVI) single-channel
- supports VESA® Extended Display Identification Data (EDID™)
- provides an active-loop-through using a DVI connector (conforming to the DVI Specification)

Appendix D: Optional Input Modules

Serial Digital Input Module ➤

The module accepts a serial digital 4:2:2 component video signal (YCbCr) via a single **SERIAL IN** BNC connector. The signal can loop through the **SERIAL OUT** BNC connector to another device (such as another projector). Inputs are 75Ω Terminated.

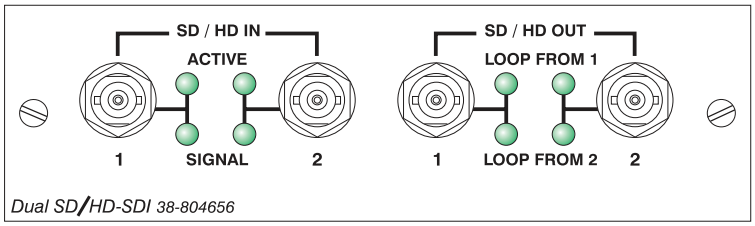


SDI Features

- accepts serial digital 4:2:2 component video (YCbCr)
- provides both a **SERIAL IN** and a **SERIAL OUT** BNC connector includes status LEDs for signal and error
- SMPTE 259M compatible

Dual SD/HD-SDI Module ➤

The *Dual SD/HD-SDI* Module enables incoming serial digital (SD or HD) data to be tiled across multiple screen displays, overlapped for extra-bright displays, or distributed to additional projectors for multiple, same-image screens.



Dual SD/HD-SDI Features

- Accepts and decodes up to two serial digital inputs
- Outputs up to two 10-bit YCbCr 4:2:2 video signals
- Provides input(s) to output(s) loop-through capability
- Supplies interchangeable inputs as part of the Picture-in Picture display
- SMPTE 259M compatible

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